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CHICAGO—CONSTRUCTION'S COST-CUTTING CAPITAL—ARBA ROAD SHOW, JULY 16-24

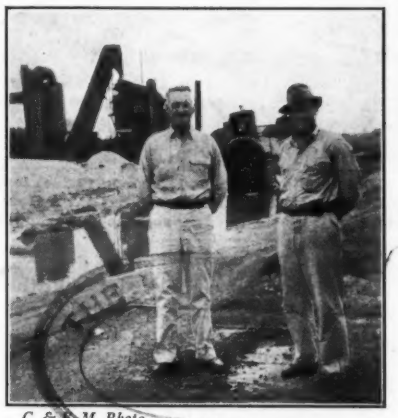
Contractors and Engineers Monthly

Vol. 45, No. 3 MARCH, 1948 $3 a Year, 50 a Copy

Covering the Field

- **Paving at Airport**
  An article on this page features fast unloading and fast routing of materials from batch plant to dual-drum pavers.
- **Bituminous Road Work**
  Hot-mix is laid over an old concrete slab, patched and widened. See page 1.
  A road-mixed bituminous surface tops crushed-rock and clay sub-base (page 64).
- **Concrete Powerhouse**
  A derrick lifts 2-yard buckets to wooden forms, as a reinforced-concrete powerhouse rises at Dale Hollow Dam. Page 2.
- **New Concrete Road**
  Good old-fashioned workmanship coupled with modern equipment speeds an 11.2-mile contract which is described on page 6.
- **Reports of Conventions**
  Road Show, effect of ERP on construction, etc., discussed by ARBA, page 9.
  The AGC (page 60) stresses labor, costs. And the AED emphasizes the tight credit situation and tax planning, page 105.
- **Highway Maintenance**
  The results of using asphalt in Mud-Jacking slurry are reported on page 17.
  Page 24 tells how Long Island town forces went after the historic "Big Snow".
- **Foundation Dewatered**
  A dewatering layout of pumps, well-points, etc., is installed to curb a rising ground-water table. See page 21.
- **Highway Grading**
  A 5.9-mile earth-moving job widens a road and reduces its curves from 53 to 6. The account appears on page 29.
- **Bridge Work**
  A concrete and steel span replaces an old bridge that failed. See page 35.
  A viaduct is kept open to traffic during all-welding repairs. See page 72.
- **Tunnel Construction**
  Bacon Tunnel, part of the Columbia Basin irrigation project, involved hard-rock digging. Job covered on page 39.
- **County Road Work**
  A secondary-roads division created within state department helps counties with F-A program. The story is on page 43.
  Page 75 tells of a northern county's snow fights, repair facilities, etc.
- **Pipe Jacked in Place**
  Methods of installing drainage pipe by static or dynamic jacking are treated in detail in an article on page 45.
- **Flood-Control Channel**
  A concrete channel to protect Los Angeles from river floods is advanced 9,000 feet. Story on page 81; pix on 54-55.
- **Highway Zoning**
  You can read on page 56 about a state's program to tell the public how zoning cuts right-of-way-acquisition costs.
- **Concrete Deterioration**
  The reaction of aggregate to alkali in cement can cause deterioration, according to the bridge study reported on page 92.

(You will find "In This Issue" on page 4)



C. & E. M. Photo
In front of the Barber-Greene asphalt plant used on the Reno Co. job in Kansas are M. J. Paul, General Superintendent, and Job Superintendent M. C. Dunn.

Old Slab Improved With Hot Topping

25-Year-Old Concrete Road Is Repaired and Widened Before Resurfacing With Asphaltic Concrete

✦ DESIGN procedures patterned after the experience and practice of the Ohio Department of Highways governed a $340,000 contract in three parts for the rehabilitation of U. S. Route 40 in Kansas. The old concrete highway, 18 feet wide, was built between 1922 and 1925. Over the long period of years, disintegration had set in to the point where further maintenance costs were not justified.

The contract was awarded to the Reno Construction Co., of Overland Park, Kans. It included patching the

(Continued on page 88)

Unique Batch Plant Speeds Airport Work

Material Handling Kept to Minimum; Trucks Haul Four Batches Each Over Paved Road to Dual-Drum Pavers

✦ THREE concrete runways, all 5,300 feet long x 150 feet wide, were completed last autumn for the new Springfield, Ill., Class IV Airport. The Wright Construction Co. of Williamston, Mich., did the work. The Civil Aeronautics Administration was the constructing agency for the project, which was the last built under the National Defense program whereby some sponsor, in this case the City of Springfield, furnished the site. Difficulty in acquiring the site, which occupies 1,100 acres on a tract located 4 miles north of the city off State Route 29, set back the date of completion.

Probably the most interesting feature from the construction angle was the batch-plant set-up which the contractor used for speedy and efficient handling of the cement, sand, and gravel. He chose for his plant site a rather small plot of land adjoining Route 29, where a little-used railroad trestle and another siding track on a high embankment came together. By taking advantage of the topographic features of the site, and by carefully spotting his bins in the most suitable location, the contractor kept batches flowing smoothly from the batch plant to the pavers on the job.

The layout was arranged so that bulk cement was unloaded from cars to bins by screw gear only, without the need of an elevator. Sand cars were unloaded in the shortest possible time by dumping both gates of a hopper-bottom car simultaneously over the sand storage pit. The batches were hauled in trucks fitted with partitions for carrying four batches to insure a constant supply of raw materials at the dual-drum concrete pavers.

Late Start

Work on the Springfield Airport had originally been expected to get under way in 1945. But because of the delays in acquiring the site, the grading operations did not get started until the late spring of 1946. The site selected is pretty much the same as all the surrounding fertile prairie lands of central and southern Illinois. Right now with food prices what they are, that rich, productive farming area is valuable, so much so that the owners were most reluctant to sell. Beneath the 1 to 2-foot layer of black topsoil is a stratum of moist clay that never seems to dry out.

Only about 5 acres of the big tract was in woodland. When this was cleared, a near-by brewery found use for the stand of white oak that was leveled. The stumps remaining were blasted out and burned. The site was slightly rolling, and the grading operations consisted chiefly of taking dirt from the higher areas and placing it on the lower levels. While the excavation totaled over 500,000 yards, it was so spread out that the cuts averaged slightly under 2 feet, with the deepest only 3½ to 4 feet.

Under the three runways and the 50-foot concrete taxiways which total 17,000 feet in length (the equivalent of 30 miles of 25-foot pavement), a granular sub-base 7 inches thick was placed and compacted. Enough material was available on the field to take care of all the necessary grading without having to resort to borrow pits. The granular sub-base, however, was hauled in from bank and river-bottom deposits.

Grading

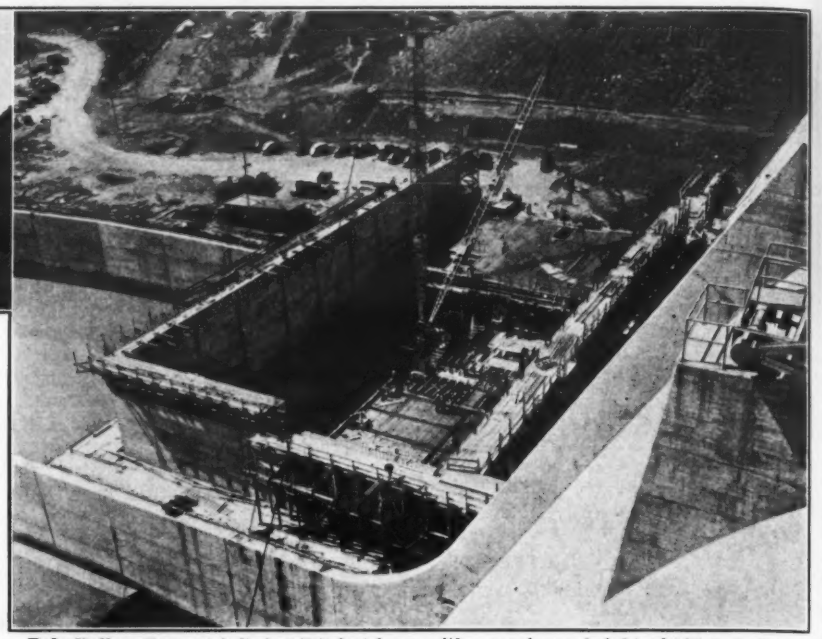
Because of the nature of the material at the airport site, no shovels were required for earth-work excavation. The dirt was moved with a combination fleet of self-propelled scrapers and tractor-drawn scrapers. For the longer hauls averaging 1,500 feet, four Super C Tournapulls were used to pull LP Carryalls averaging 10 yards to the load. A Caterpillar D8 pusher tractor assisted in the loading. For the shorter hauls, up to a maximum of 800 feet, the dirt was moved by five LeTourneau FP Carryalls averaging 12 yards a load and pulled by D8 tractors. A couple of D7 dozers worked with the earth-moving equipment, push-loading and spreading the dirt on the fills. Three motor graders, two Caterpillar No. 12's and an Allis-Chalmers, also assisted in the spreading, leveling, and shaping.

The specifications required the dirt to be placed in 8-inch lifts with 90 per

(Continued on page 12)

TUNNEL BORED THROUGH HARD LAVA

C. & E. M. Photo
A Conway mucking machine loads blasted rock from Bacon Tunnel to a Western 5-yard side-dump car. This key structure in the Columbia Basin project is covered on page 39.



Dale Hollow Dam, at left, is 1,717 feet long, with a maximum height of 185 feet above its lowest foundation. Looking down from the top of the dam in the photo at right, we see the powerhouse under construction.

Concrete Powerhouse Is Built for High Dam

Batch Plant Delivers Mix To 2-Yard Buckets Which Are Lifted to Wood Forms By Stiffleg Derrick

By WILLIAM H. QUIRK,
Eastern Editor

✦ A BIG hydroelectric power plant is now being completed at Dale Hollow Dam on the Obey River in Tennessee, about 80 miles northeast of Nashville. It is a reinforced-concrete structure of the conventional indoor type. And it is located directly at the downstream base of the power-intake section of the dam. Designed to provide space for three main generating units, the plant will also contain a station service unit, a service bay, and the necessary room for controls, auxiliaries, and offices. An indoor traveling crane of 100-ton capacity will handle the heavy equipment. The initial power installation will consist of two 18,000-kw generators, while a third unit of like capacity will be placed at some future date.

The powerhouse is part of the Dale Hollow Dam and Reservoir Project constructed by the Corps of Engineers, Nashville District. It embraces the combined purposes of flood control, generation of hydroelectric power, and provision of recreational areas. The project in turn is part of a coordinated plan for the control of floods and the development of water resources of the Cumberland River Basin.

The Obey River empties into the Cumberland 7 miles below the dam. This work is an integral unit of the comprehensive plan of development for the Ohio and Mississippi Rivers. Although the primary purpose of the Dale Hollow Project is flood control, the electric power made available by this installation is of considerable importance. The electrical energy which can be generated is sufficient to supply the needs of an average city with a population of 50,000.

Work on the completion of the powerhouse started in July, 1946, after the Corps of Engineers awarded a contract for its construction to the Morrison-Knudsen Co., Inc., of Boise, Idaho, for $1,720,341.50. The first generating unit is now being installed, and it is estimated that it will be ready for operation in the spring of 1948. Completion of the second unit is expected to follow within about two months of that of the first unit.

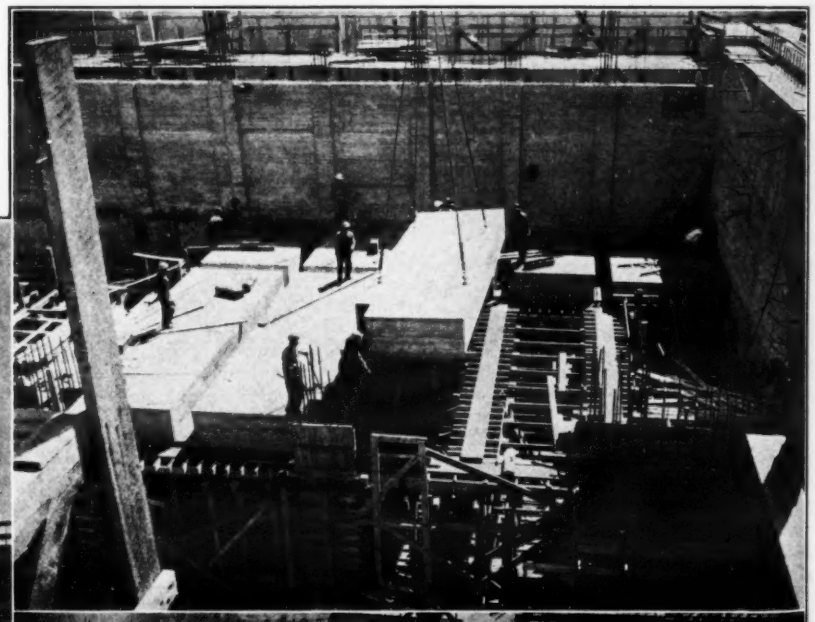
Dam and Reservoir

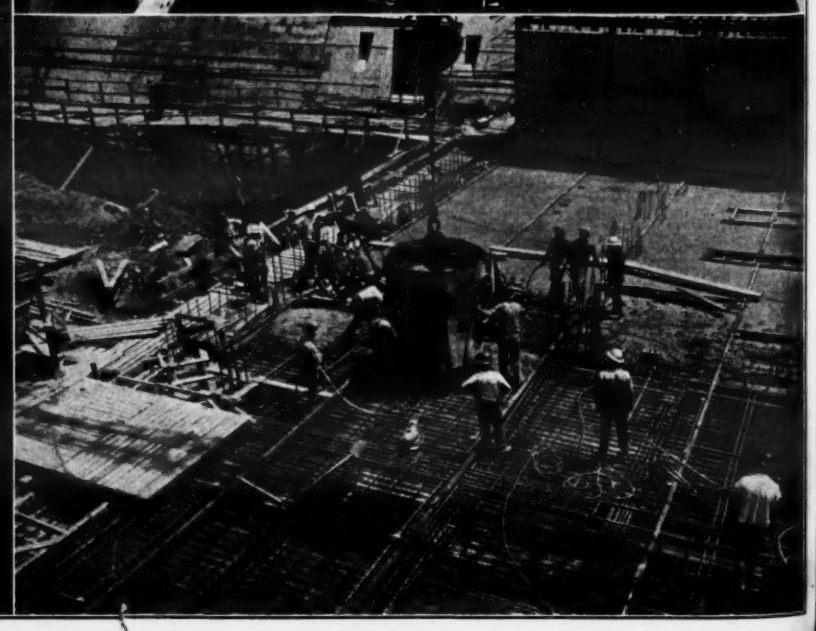
Morrison-Knudson Co. also built the dam itself between March, 1942, and October, 1943, along with the powerhouse substructure. With the primary purpose of flood control then in effect, further work on the project was suspended to conserve man-power and materials for the war effort. The dam is an all-concrete structure, 1,717 feet long, with a maximum height of 185 feet above its lowest foundation. Spillway and power-intake sections of the dam occupy the flood-plain portion of the valley width, and are flanked by non-overflow transition sections which tie into the valley walls. Flow over the spillway is controlled by six radial gates, 12 x 60 feet, which surmount the crest. Water may also be released from the reservoir as desired through four sluices, 6 x 4 feet, which extend through the base of the section.

The gravity-type ogee spillway is designed to dissipate the enormous amount of energy created by the fast-moving water flowing over the crest, without damage to the foundation. The stilling basin is the bucket type. The power-intake section, adjoining the spillway, contains three penstocks 15 feet in diameter to supply water from the reservoir to the turbines in the power-

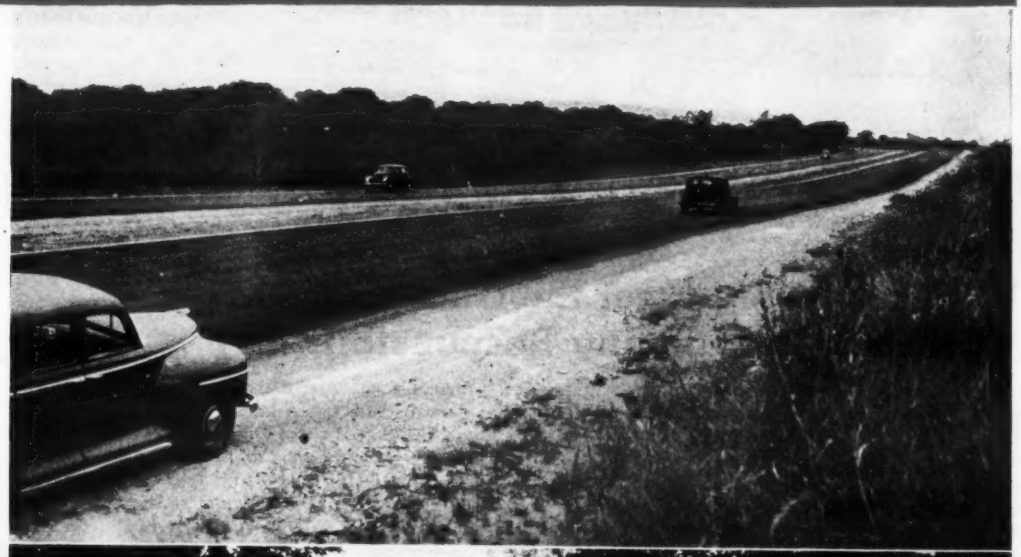
(*Continued on page* 100)

These three photos show work in progress at 550 elevation level of the Dale Hollow Dam powerhouse. Below, looking southeast towards the dam, we see the form work for columns. At top right, workmen place a section of form for the floor slab. Below, a 2-yard concrete bucket swung over the floor forms by a derrick has just deposited its load.

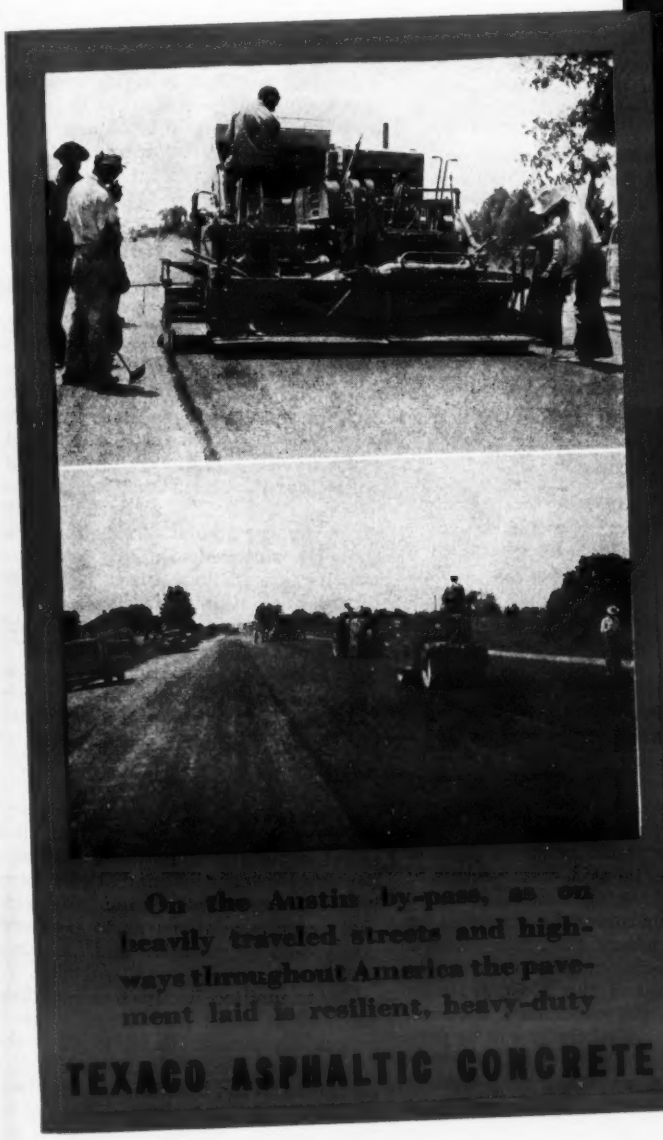




New By-pass eases the traffic problem of Austin, Texas



The Austin by-pass is a good example of modern highway design, including boulevard sections in which lanes carrying opposing traffic are separated. All lanes have ample width. The asphalt surface was laid by the Collins Construction Company, Austin, for Holland Page Industries, Austin.



On the Austin by-pass, as on heavily traveled streets and highways throughout America the pavement laid is resilient, heavy-duty

TEXACO ASPHALTIC CONCRETE

One of the chief headaches of public officials today is the problem of traffic congestion. Successful efforts to cure this ill, therefore, are of special interest to road builders. The Austin, Texas, by-pass is a good example of how engineers are tackling this problem effectively. Constructed east of the city by the Texas State Highway Department, this by-pass links U.S. 290 with U.S. 81. Both through traffic and local traffic benefit from the project in time saved, as well as in greater driving comfort and safety.

A 1½-inch Texaco Asphaltic Concrete pavement of the hot-mix type has been laid to serve the heavy traffic of the Austin by-pass. Supporting the Texaco surface is an 8-inch crushed limestone base, primed with MC-5 Cutback Asphalt and tack-coated with RC-2 Cutback.

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TEXACO ASPHALT

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Will Engineers Meet the Challenge Of Their Broadening Responsibilities?

Engineers can walk in firmly where politicians fear to tread. So stated William L. Batt, President of SKF Industries, in an address at the recent annual meeting of the American Society of Civil Engineers. His subject was the vast new area of responsibility which is opening up for the engineering profession—a subject which stimulates new lines of thinking about the challenge and opportunities for the engineer in today's chaotic world.

"All of us have witnessed in this last hectic decade a tremendous expansion of the horizons of engineering. Many among us have worked in distant places in the past few years and under circumstances which most of us could not have imagined in our wildest dreams", Mr. Batt said. And most of this work, he pointed out, has been to translate into practical terms the policies which have been shaped by our political leaders.

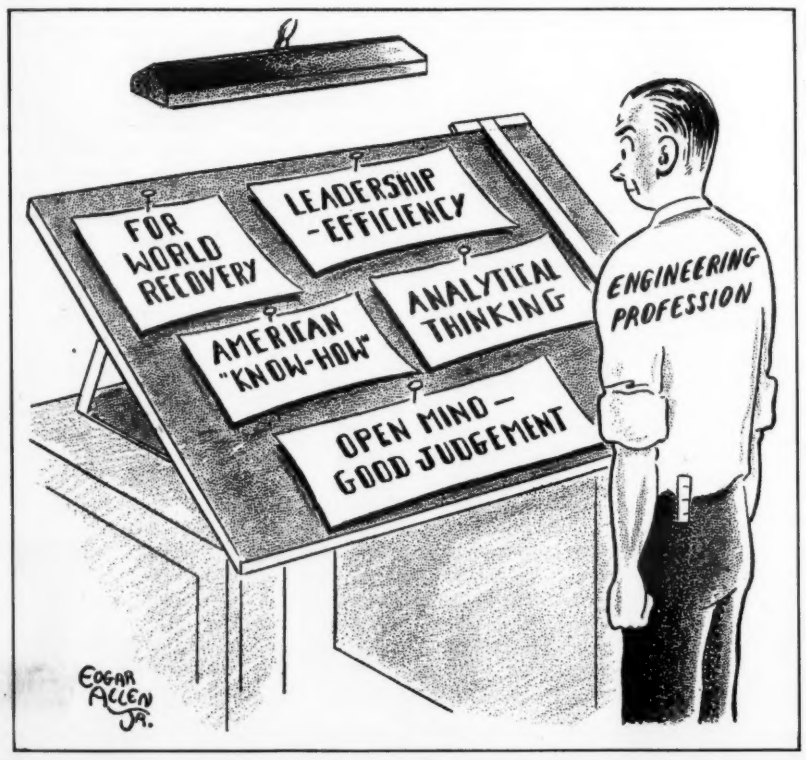
It is the general consensus that on the European Recovery Plan—what it is, how much and what kind of aid it gives, and when it is put into effect—hangs the destiny of the world for many years to come. Mr. Batt believes that the engineers of America have it within their power to influence that destiny.

The American engineer's position is one of great influence, said Mr. Batt, because the engineer personifies what is referred to and admired the world around as "American know-how". Whereas the ordinary run of American politician inspires distrust when he attempts to guide the destinies of other nations, the American engineer is more fortunately regarded. His skill and knowledge are universally praised. And if the job of rehabilitating Europe and modernizing its economy is to be done, the engineer and not the politician will do it. For the engineer is not concerned with being reelected, but with efficiency and results. This becomes increasingly obvious, Mr. Batt stated, when one considers that our nation's political development has lagged far behind its economic growth. And this is a fact that is at once apparent to the European.

Mr. Batt urged that business organizations in this country lend some of their engineers and production experts to the administrators of the European Recovery Program for duty abroad. He believes that a capable corps of American engineers working with the engineers of the various nations in Europe could do more than any other group of men to insure that the funds and goods granted under the Marshall Plan are not wasted. In addition, one of the most valuable functions of such engineers will be to exchange knowledge and experience with the men of other nations. The engineers who go abroad will be helping Europe to realize all over again the major benefit of the industrial revolution: that when large regions of the earth or important segments of the population are equipped to produce efficiently, the result is not a falling off but an increase of trade for all.

Construction cannot be overlooked in the vast job of European rehabilitation and recovery. An enormous amount of reconstruction is necessary before a return to general welfare and a functioning economy can be achieved. In all this, American engineers can make a great contribution. But most of all, the qualities that make a good engineer are the qualities needed for the leadership and statesmanship which alone can take the world along the paths of peace and prosperity. To assume some of that leadership, to bring to world affairs and recovery problems the open minds, the efficiency, the capacity for analytical thinking, the exercise of good judgement, that "know-how" which has made American engineers world-renowned and universally admired—that is today's challenge to the engineering profession.

TODAY'S CHALLENGE!



The Laws of Chance And Highway Traffic

Your chances of filling an inside straight, or being dealt a 13-spade bridge hand, are akin to the problems met in planning engineering projects—they are related by the laws of chance or probability. But the theory of probability, which has given many a card player sleepless nights, was elevated to a more serious purpose at the 95th Annual Meeting of the American Society of Civil Engineers in New York City in January.

Professor Henson K. Stephenson, of Texas A. & M.'s Structural Engineering Department, presented a paper in which he used the theory as an approach to solving problems which are associated with the behavior of highway traffic. Appearing before the Structural Division of the Society, Professor Stephenson dealt with the problem of vehicle grouping from a mathematical standpoint, "based on the same laws of chance or probability that have already been used successfully for solving many other types of engineering problems".

His paper illustrated the use of the method to estimate how often various sequences or groups of vehicles can be expected within given lengths of time or distance along the highway. This estimate would be useful, he pointed out, in the construction of highway bridges, where economies could be effected in concrete and steel. It would also help determine the need for warning or stop lights at intersections, or the timing of traffic lights at such intersections for the most efficient movement of traffic.

Dividing traffic into three categories, Professor Stephenson sought to work out its most probable behavior pattern. At first glance, he said, traffic seems to be an ever-changing flow of vehicles whose behavior cannot be predicted by mathematical means. "Yet," he said, "if at any given location, the most probable traffic pattern and the most probable average speed are established, the most probable behavior of traffic can be predicted by that means. Although the type of analysis discussed has been applied to only a limited number of observed traffic data, the high degree of correlation between the observed and the calculated results obtained from these studies indicates that the behavior of highway traffic coincides rather closely with the assumptions upon which the mathematical procedures were developed."

Professor Stephenson emphasized that the main objective of his paper was to develop a method, rather than to reach numerical conclusions. Discussing how to apply this method, he said:

"A highway bridge, in order to perform its function safely, must be designed not only for the maximum stresses which may occur only once during its useful life, but also for varying numbers of repetitions of other stresses, less than the maximum". These lower stresses "might otherwise result in a fatigue failure if the design stresses are not properly reduced to provide for them, or if the various numbers of high-stress repetitions are not estimated correctly and on the side of safety. . . . And since both the maximum stresses, and varying numbers of lower stresses . . . are practically all produced by heavy vehicle groups rather than by individual trucks, it is highly important that a satisfactory method be developed for estimating how often these events would be expected to occur as a result of any given or anticipated traffic conditions."

State Highway Departments' Salary and Wage Practices

A report called the "Salary and Wage Practices of State Highway Departments" has been prepared by the Committee on Highway Organization and Administration of the Highway Research Board. It is especially timely since almost all highway administrators agree that their construction programs are being delayed by a shortage of engineering personnel; and that this shortage is caused to a large extent by salaries lower than those paid elsewhere. Factual data for the study were obtained by a questionnaire to which forty-three states had responded in time to permit tabulation and analysis of their data for inclusion in this report.

Among the topics discussed in Bulletin No. 9 are the present shortage of engineering personnel, a general appraisal of existing salary plans, an analysis of state highway department salary data, supplemental items that affect comparisons between highway-department salaries and those elsewhere, suggested salary increases, general recommendations as to personnel policy, and organization and the salary problem.

The committee discusses each of these subjects in great detail, and when it makes recommendations, it gives the reasons for their advancement. Also contained in the booklet is a list of the findings and conclusions arrived at by the committee. These are given in the form of twenty brief statements.

Copies of Bulletin No. 9 can be obtained by writing to the Highway Research Board, 2101 Constitution Ave. Washington 25, D.C. The cost is 60 cents per copy postpaid, with special prices for members and when the bulletins are ordered in quantity.

ARBA Road Show

ARBA reports more than 1,000,000 square feet of exhibit space taken for the Road Show which will be held at Soldier Field, Chicago, July 16-24.

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Two-Lane Concreting Is Pushed Full Speed

Paving Records Broken As Fast Crew Completes 11-Mile Pavement Ahead Of Scheduled Deadline

By RAYMOND P. DAY,
Western Editor

✦ TRAVELING with unusual efficiency, concrete-paving machines of the Bushman Construction Co. of Kansas City, Mo., brought to rapid completion a new 11.2-mile section of State Highway 33 for the Wisconsin State Highway Commission. Sparked by enthusiasm from both the contractor's side and the State's side of the fence, the job produced a smooth-riding concrete road, one of the best Wisconsin has built.

The word spread like wildfire among stolid citizens between Reedsburg and Baraboo, Wis., that the new highway was a fine one. Long before the job was finished their automobiles were seen stealing rides over the new route. And when asked their lay opinion of this new highway, they would say, "It's good. It's what we need."

This piece of good workmanship is not some "superhighway" on a mainstem route. It is a secondary state road only 20 feet wide, with 6 and 8-foot gravel shoulders. It carried the Federal-Aid project number of F-012-2 (12), and cost Wisconsin and the United States $419,000 for the Bushman contract.

Workmanship Comes First

The workmanship which went into this road is something even more important than the mechanical perfection of paving equipment on the job. Workmanship may be a little old-fashioned. But without it, the finest machinery in the world cannot make a highway smooth.

The spark of enthusiasm flared up throughout the crew. All seemed happy when their work moved most rapidly. The huge negro concrete finisher hummed a tune as he floated the concrete to perfection behind the last finishing machine. With 26 years of finishing to his credit, this to him was one of his most interesting jobs.

And little Freddie Longfield, rookie 23-year-old materials man, paced the floor half the night keeping everybody at his rooming house awake as he muttered, "It just ain't my fault that they made 20 feet on me over our concrete yield today! I followed all the rules. . . ." Freddie has since learned that air-entrained concrete is a temperamental thing, and that constant watching is one of the answers to his problem.

Designed to Modern Standards

The new road was designed to Wisconsin's up-to-date standards for strength, carrying capacity, and alignment. Replacing the old existing crooked highway between Baraboo and Reedsburg, the new highway eliminates many of the vertical and horizontal curves, and is a 70-mile-an-hour highway.

Most of the old road-mixed blacktop was saved and put back down after the grading had been completed in September, 1946. A 4-inch sand blanket over that material carries the new 20-foot concrete slab 8 inches thick.

The concrete was placed with a 1½-inch straight crown from the center to the outside of pavement. Shoulder work included an extension of the sand cushion to the outside of the slope to drain off any moisture collecting under the pavement. A layer of salvaged black-top 3 inches thick with a 3-inch topping of crushed gravel, compacted to good density, completed the shoulders. Most shoulders were built with a slope of 1 inch per foot.

An existing highway bridge across Dell Creek was used, and this was the only point along the whole 11.2-mile route where expansion joints were placed. Transverse mastic contraction joints on 20-foot centers were placed by a Flex-Plane machine, and a continuous longitudinal strip down the center was placed while the slab was being poured. The ¼ x 3-inch material was set about ¼ inch below the concrete surface. And when the job had been finished, the extrusion of mastic material was a rarity rather than a rule.

Joints were made at the end of a day's pour by placing a wood header, and pouring fresh concrete right up against the old concrete the next morning, after removing the header board.

Subgrade Work

Each day the gravel and bituminous-mat subgrade was dressed for several miles ahead of the concrete paver by a Caterpillar No. 12 motor grader. Then as the paver came up within 2,000 feet or so, the grader swept in the sand blanket which would go under the pavement. The volume of sand had previously been calculated as it was dumped along the side of the road, so it was relatively easy to dump it in place with accuracy. In view of the fact that any excess material had to be handled later by laborers, as we shall see, this was quite important.

The form trench was also scooped out by the Caterpillar motor grader, and the excess earth dumped just outside the concrete line.

Although daily production figures usually edged over 1,200 feet and sometimes reached as high as 1,325 feet, only 16 men were used in the preliminary crew. Every man was a crackerjack at his trade. Four men leveled the subgrade under the forms. Two men set forms. Two men kept a string line set ahead to surveyor's stakes. Two men lined up the forms after they were set. Two men tamped the form bases and two more men were kept busy driving pins. An operator on the Caterpillar motor grader, and a tractor operator who used a Caterpillar D6 with an 8-yard LeTourneau Carryall to keep the sand subgrade equalized, completed the crew.

Superman Sets the Forms

To the experienced paving man, looking at only 2,500 linear road-feet of Metaform and Heltzel steel forms, it might appear that daily footages of 1,200 feet would be crowding it a little close. But the answer to that on this job, according to Superintendent E. W. Voeks, was "You see, we've got Ted Jones on this job".

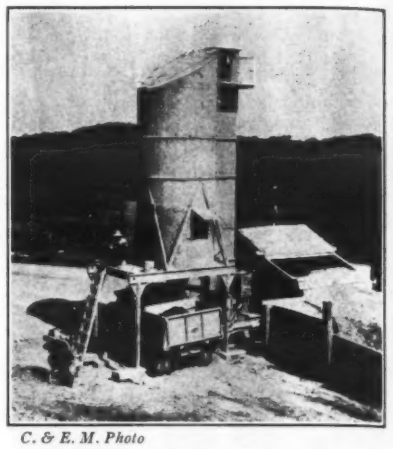
At 41, Ted Jones has developed throughout the midwest a prestige as a form setter that rivals the renown of a good superintendent or foreman. He is a good-natured, easy-going man, built lean and wiry like a tree feller in the north woods. He can kill off men half his age. On one job they gave him a helper for half the daily stint; changed helpers the second half!

One spring Ted Jones got seven telegrams to report for work. Why? Ted Jones, so far back as he can remember, says that he has never worked a full shift. Regardless of the size of a pour, he will set all the forms ahead usually by noon or a little after. He would rather handle 200-pound sections than the lighter forms, because they make a prettier looking joint!

He can set forms with his helper as fast as two men can throw them off a flat-bed truck. Then, while he waits for another truckload, he lines the key end of each section and drives one steel pin. On this job he drove pins so fast that his helper failed to keep up with his flailing sledgehammer on the same pin.

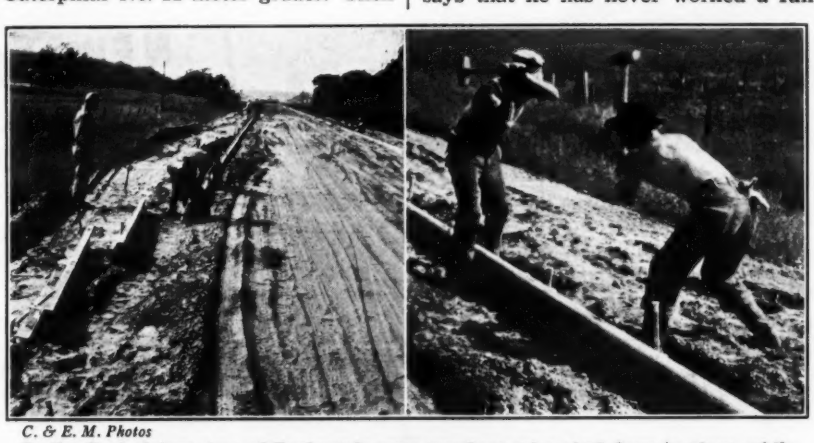
Ted Jones is not boastful. He is a quiet, unassuming, industrious workman. Wearing a motorcycle belt around his middle to protect his back, he drives pins while younger men wander off for a drink of water.

The forms were kept ahead of the paver as far as the previous day's pour. And they were all set usually by early in the afternoon. A section was left out every 500 feet or so to let the batch trucks turn around to back in to the paver, but the rest were well staked. Some of the stake driving was tough, too, especially through one sandstone cut where dirt banked against the forms had to substitute for pin penetration.



C. & E. M. Photo

A batch truck gets a load of cement from the Johnson 100-barrel silo at the batch plant which Bushman Construction Co. set up for its 11.2-mile concrete paving job.



C. & E. M. Photos

In the first picture, two of Bushman's crew members set a steel form in place, while Grade Foreman R. E. Adkins looks on. In the second, Ted Jones at the left, wearing his motorcycle belt, and Shorty Farnsworth team up to drive a form pin.

Trucks Compact Sand

The sand blanket was not disturbed after the forms were set except for the passage of batch trucks. They compacted the material to a great extent. The sand blanket was not planed off until after the 34-E MultiFoote paver had passed over it.

A shop-made planer, attached by draw bars to the paver, dressed the sand blanket smooth. Water squirted from a hose just ahead of the paver made the sand cut firm and true. Two laborers with shovels tended this planer. It was their job to see that the planer blade stayed full of sand all the way without raising the wheels off the forms. If the wheels rose, the planer had to be backed up and brought ahead again. Excess sand skimmed up by the planer was shoveled out to the side, and used later for the shoulder work. However, the blanket had been put in with such accuracy that the two men were able to take care of the job quite satisfactorily.

Pouring Concrete

A MultiFoote 34-E single-drum paver was used to mix the concrete. It had a dual-gate bucket, a 38-foot boom, and an excellent operator, Floyd Reynolds.

"I hired Reynolds as a master mechanic", said E. W. Voeks, General Superintendent. "When our paver came in I asked him if he could run it. He said he'd try, but he didn't claim to be a good operator.

"That paver came down off the railroad car prettier than I've ever seen a machine unloaded in all the years I've been in the business. He's been running it ever since. No matter how much we pour we never seem to have a paver

(Continued on next page)

C. & E. M. Photos

This shop-made planer (left) attached to the 34-E MultiFoote paver fine-graded sand sub-base on the Reedsburg-to-Baraboo job. At right, a bucket full of concrete dumps down on the subgrade as a Jaeger-Lakewood spreader moves up.

breakdown. The guy seems able to run any piece of equipment just as well, too. I'm sure glad we found him."

Voeks spotted his paver between the forms, leaving an occasional form section out to permit the batch trucks to turn around. This also permitted personal automobiles of the crew to be brought up close to the job.

Mixing water was pumped from Dell Creek, about halfway through the job, and brought up to the paver by three Ford trucks. Each machine carried a 1,200-gallon water tank. The water was fed to the paver by a 2½-inch Gorman-Rupp centrifugal pump, carried on the paver. About 125 feet of flexible hose carried the water from the trucks. As the trucks moved ahead with the paver, the hose dragged along the shoulder.

Water trucks had to use a right-of-way ditch at the bottom of the backslope. Sometimes it was rough going. A tractor was handy at all times to pull a truck through the worst places, and to prevent any delay to operations.

Mixing time was 60 seconds, and the concrete was placed at an average slump of 2¼ inches. The air content of the mix, designed for from 3 to 6 per cent, was checked daily. Increasing the amount of sand in the mix jumped the air content at once. According to Resident Engineer H. A. Balsley, there were quite a few variables to contend with, but close attention and frequent checks of actual footage against the theoretical yield succeeded in keeping the concrete within the limits of the specifications.

In dumping the fresh concrete, the first batch of a move was always placed close to the paver and directly behind the subgrade planer. The top surface of this batch was then struck off 4 inches above the subgrade by a steel blade 24 inches wide, towed along behind the planer blade. Strips of ¼-inch-diameter dowels 24 inches long were then laid longitudinally along the center joint. Each dowel was spaced 10 inches apart, and the ends were tied together by a ¼-inch round bar to make up the mat. The mats were laid in place 4 inches above the subgrade by one laborer, who stamped them down in the concrete with his feet and a shovel.

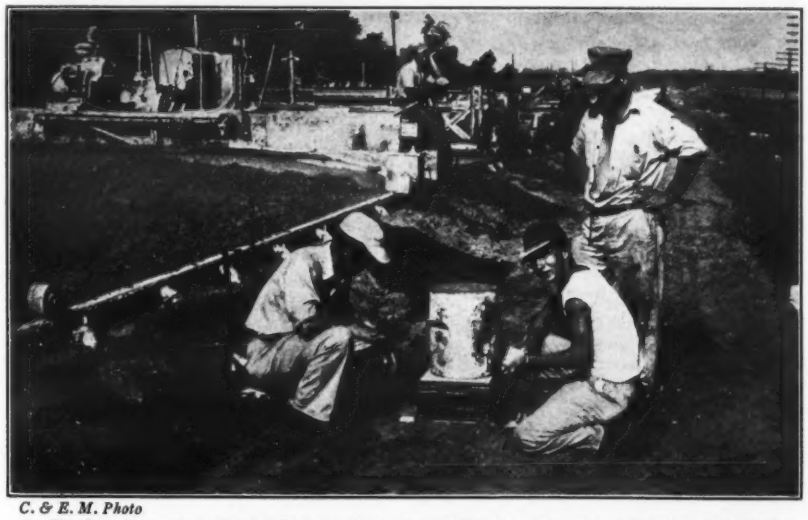
Working the Concrete

Of all the tricky things about air-entraining mixes, perhaps the worst on this project was a tendency of the rock aggregates to be so well graded throughout that they appeared close to the top of the slab. Thus the distribution and finishing of the slab was a matter where time was of the utmost importance.

A Jaeger-Lakewood spreader first distributed the fresh concrete evenly between the forms. Several passes were generally required. Two Jackson vibrators at the rear end of this machine could be raised or lowered, started or stopped by the operator. Swiveled at the vibrator motor, the raising or lowering motion was hooked through cables to a long lever near the operator's seat.

The development of the vibrators in that position came about the hard way as a result of a bad accident several years back on one of the company's jobs. Then it was the rule to have a laborer on each side of the machine handle the vibrators. One day a man stepped down on a form as the spreader backed up. The heavy wheels passed over his foot and mashed off his toes. Superintendent Voeks resolved then and there to take the human equation out of that part of the work. Now the vibrators are mounted where men will not be placed in a dangerous position to operate them.

The transverse and longitudinal strips were next placed in slots cut by a Flex-Plane machine. The ends of the transverse strips were snipped off in a V by tin snips, to permit the longitudinal cutting knife to pass through without displacing the material.



C. & E. M. Photo

As Paving Inspector Fred Balsley (left) and Materials Inspector Freddie Longfield (center) run an air-entraining test, Superintendent E. W. Voeks (right) watches.

A final mechanical finish was then put on by a Koehring Longitudinal Finisher. Excess grout or laitance swept off by this machine was immediately shoveled away from the forms by a workman. Hubert Keller, the operator of the Flex-Plane machine, performed a valuable service to the 80-man crew each day by hauling out several cases of cold Coca-Cola, soda, and the like. Business seemed to be on the coin-matching side. "Double or nothing!" was Keller's motto, and he managed to come out about even while having a lot of fun being of service to the boys.

The surface finish was put on after two finishers had put down an initial surface with long-handled steel straight-edges. Working from either side of the slab, they smoothed out all the humps or ridges. However, they did find it difficult to get high places down, because of the good distribution of rock throughout the mix. For that reason the Koehring finisher operator had to be quite careful.

A burlap drag was next pulled over the concrete with the grain of the road. A burlap strip was also carried behind

(*Concluded on next page*)

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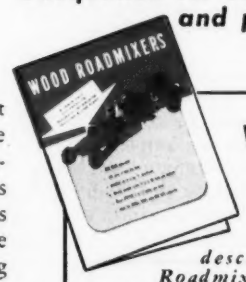

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Two-Lane Concreting Is Pushed Full Speed

(Continued from preceding page)

the finisher's bridge to put part of this dressing on. It is believed that this finish results in a safe, silent riding surface.

When the concrete took on its initial set, the surface was lightly sprinkled with water and 50-foot rolls of Sisalkraft curing blankets were laid on the slab. The sides were held down by form pins and sand. Next day after the pour the form pins were extracted by lever pin pullers, the forms hauled ahead, and the edges of the paper turned down to cure the concrete for three days.

Even with a minimum of equipment, a small crew, and a problem of restricted working space on both sides of the slab, the job sped through in short order. Paving, which started July 21, was finished 60 days later. The fast, hard-driving crew averaged 7,000 feet per 6-day week, working 10 hours each day.

Batch-Plant Set-Up

When paving started at the west end of the project at Reedsburg, the batch plant was set up near the center of the job. When the new pavement had been finished to that point the plant was moved to the east end, where a subcontract had been let to Koepke Construction Co. of Appleton, Wis., to produce and wash the sand and concrete aggregates.

The batching set-up consisted of a Johnson bin with two 25-ton compartments for the rock, a Johnson 50-ton sand-batching bin, and a Johnson 100-barrel bulk-cement silo. These units were so set up that a batch truck could drive straight through, without delay or crossing of traffic, to pick up its load.

Koepke used Cedarapids crushing and screening equipment to produce the material, which was then transferred to the batch bins. A Lima crane with a 45-foot boom was used to raise the two sizes of rock; a Koehring 301 with a 45-foot boom kept the sand bins loaded.

Universal air-entraining cement came in from Buffington, Ill., by railroad to Baraboo, was unloaded by a screw conveyor from bottom-dump cars, and transferred through a Johnson bin to three transport trucks. These trucks hauled the cement out to the cement silo at the batch plant. A screw conveyor from the hopper to the silo kept the bin full.

While Superintendent Voeks would have liked to use 20 batch trucks on the longest hauls, he never was able to get more than 18. On the record day, when 1,325 feet was poured, only 13 batch trucks managed to haul 466 batches. Since each truck carried two of the 38-cubic-foot batches, this represented 233 loads. It meant traveling at least 40 miles an hour over the 5-mile one-way road.

In driving through under the different batchers, the trucks first got the pea gravel and coarse-rock portions of their batch. Then the sand was dumped in one side of the truck compartment. Bulk cement went on last, in the other side of the top. A laborer scooped a little sand over the cement to prevent any from escaping.

The batching operation was speeded up considerably when the sand bin was arranged so both batches of sand could be dumped simultaneously. Prior to that time a truck took on a batch in the forward compartment, then had to pull ahead to get the second batch. The changeover was made by putting dump bins on an angle-iron track.

Concrete batches were weighed out according to the following dry-weight design:

Sand	1,655 lbs.
No. 1 rock	1,187 lbs.
No. 2 rock	1,640 lbs.
Cement	734 lbs.

Personnel

The project was designed and supervised under the general direction of Emmons L. Roettiger, State Highway Engineer for the Wisconsin State Highway Commission, with Albert T. Bleck in charge as Construction Engineer. H. A. Balsley was the Resident Engineer.

E. W. Voeks, General Superintendent for Bushman Construction Co., was in charge of construction work in the field, assisted by Webb Chapman, Engineer for the company. R. E. Adkins was in charge of building grade ahead of the paver.

Pushed through in record time, with the single-drum paver working at peak capacity for sixty days, the job was one of the most efficient concrete-paving jobs in the country for the season of 1947.

Shaffer Joins Roller Co.

The appointment of Murray D. Shaffer as Director of Sales and Research Consultant has been announced by the Buffalo-Springfield Roller Co., Springfield, Ohio. Mr. Shaffer formerly was Director of the Ohio Department of Highways.

The sale of Buffalo-Springfield rollers is conducted through exclusive distributors located throughout the United States and foreign countries, and Mr. Shaffer will direct sales through this organization in both the domestic and export markets.

Cement-Stabilizer Catalog

A folder on its pozzuolanic cement stabilizer is available from The Sullivan Co., 219 Cambridge St., Memphis 2, Tenn. In addition to listing the features and recommended uses of Konset, the folder also contains complete instructions on how to handle it.

Konset, the folder says, will harden concrete, making it dust-resisting; increase plasticity without increasing the per cent of water; reduce shrinkage; improve the tensile and compressive strength; permit pouring at temperatures as low as 3 degrees below freezing; increase bonding, density, and acid and oil resistance.

The folder also tells of Konset Maximizer for heavy-duty concrete, and explains the features of this material.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 68.

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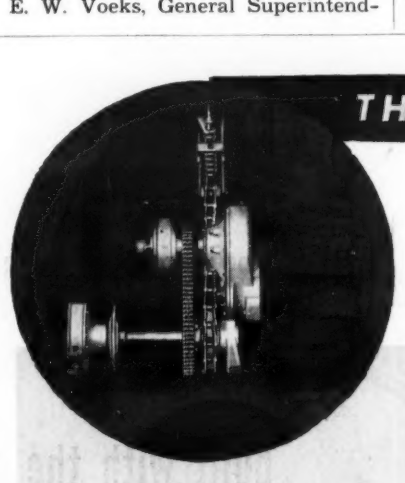
THE CHAIN TAKES THE STRAIN



The exclusive Rex Chain Drum Drive eliminates stresses and strains. The chain protects the transmission . . . gears . . . shafting . . . power plant. It eliminates binding between drum and transmission during the mixing action. And since the chain transmits power in the "up" direction, the load on the drum rollers is materially reduced.

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Rex Mixers are designed to turn out *more* batches per day with far less manual effort. Operator can handle all controls from one spot. All have ample leverage . . . swing through short, easy arcs for safe, convenient, easy operation. For example, the discharge chute . . . it's outside the drum while mixing, and the operator just gives the lever an easy push that swings the chute into the drum. He doesn't have to lift a chute-full of concrete as is the case on the ordinary chute that's inside the drum during mixing.

There are a lot of other important "Plus" advantages of Rex Mixers. For all the facts, see your Rex Distributor, or write for your copy of Bulletin No. 47-10. Chain Belt Company, 1666 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT **REX** COMPANY — CONSTRUCTION MACHINERY

Road Builders Urge More Federal Aid

ARBA Winter Conference Hears Plans for Coming Road Show; Construction To Be Affected by ERP

✦ THE American Road Builders' Association, at a conference in Washington, D. C., in January, passed a resolution urging that Federal-Aid funds for road construction be increased from $500,000,000 to $800,000,000 a year in order to keep the nation's highway system in adequate public service.

At the three-day meeting J. T. Callaway, the re-elected president of ARBA, told the delegates that the coming nine-day Road Show to be held at Soldier Field, Chicago, July 16-24, will be the biggest ever. Plans already include over 250 exhibitors using about 1,000,000 square feet of space, as compared with the 176,000-square-foot area required by the last Road Show held in 1940.

The European Recovery Program, and its impact on the road-building industry, was also discussed before the convention by members of Congress and Government spokesmen.

President's Report

In his annual report, President Callaway indicated that from the advance requests for hotel reservations in Chicago, the Road Show will have better than 100,000 visitors. He emphasized the point that the layman, and especially the sidewalk superintendent, will have the opportunity to see, study, and understand the cost-cutting equipment designed for the big construction jobs ahead. And that if it were not for this man-hour-saving machinery, highways as well as airports, dams, flood control, irrigation, soil conservation, and other types of construction could not be accomplished for ten times the present costs.

An invitation to attend the Road Show was extended to President Truman by a delegation from the ARBA headed by J. T. Callaway.

Mr. Callaway also paid tribute to California's ten-year nearly $3,000,000,000 post-war highway program, which is legally financed for immediate construction. That this program was sorely needed was evident from the bottlenecks existing in every city and town, with economic progress "hanging heavy on the ropes". Motor-vehicle registration had soared, and in 1945 the highway fatality figure had reached 15.5 per 100,000,000 vehicle miles in California, as opposed to a new national high of 11.4 and 3.5 for the ultra-safe Merritt Parkway in Connecticut.

Road Program Progressing

At the opening day's session Major General Philip B. Fleming, Administrator, Federal Works Agency, asserted that "the war set us back at least five years in the normal development of our highway system". He added that considering the magnitude of the task and the unstable economic conditions that have prevailed since the end of the war, it is not surprising that the post-war highway program had a slow start.

The program is picking up, however, and the General mentioned that the contract awards authorized by the states in 1947 called for $895,000,000 worth of work on 44,700 miles of road. This was approximately $150,000,000 more than the cost of road construction contracted for in 1946. At the same time, the General went on, motor-vehicle registration by the end of the year reached an estimated 37,000,000—an increase of more than 3,000,000 over 1946 registrations, and approximately 2,644,000 more than the number of vehicles registered in 1941, the previous peak year. "At this rate of increase," he observed, "it is not difficult to imagine what travel on our principal highways will be like in 1950 unless revolutionary measures are adopted to relieve traffic congestion."

With regard to prospects for highway construction, General Fleming stated that at present 12,589 miles of highway and over 2,600 bridges are under construction as Federal-Aid projects. On this work the Federal government is to pay $374,000,000 of the total cost of $719,000,000. In addition nearly 7,000 miles of highway and 1,233 bridges have been approved for contract letting.

"The most striking development in the years immediately ahead", said the General, "will be the construction of express highways into and through large cities. A few such urban highways, embodying controlled-access features which permit traffic to move safely through crowded business districts at a speed of 35 to 45 miles an hour, were built before the war—notably the Davison Limited Highway in Detroit, the Henry Hudson Parkway in New York, and the Arroyo Seco Expressway in Los Angeles. These free-flowing traffic arteries have fully demonstrated the value of controlled-access expressways as a means of breaking urban traffic bottlenecks."

High Construction Costs

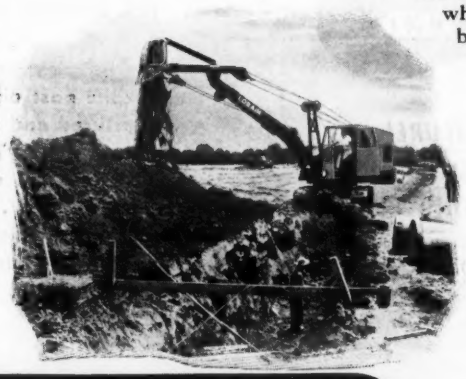
Speaking before the Contractors' Division of the ARBA, A. C. Clark, Chief, Division of Construction of the Public Roads Administration, revealed that costs during the past year reflected an increase of perhaps 90 per cent over the 1940 level, and 14.5 per cent above that of 1946. Bids in the amount of $115,000,000, or 15 per cent of the total low bids received, were rejected as being excessive.

To prevent an undue upsurge in prices, corrective steps are being taken, according to Mr. Clark. They include: the adoption of short-term contracts to eliminate gambling on increased costs occasioned by future economic developments; elimination of obscure and indefinite provisions in the specifications; elimination of unnecessary hand work,

(Continued on next page)

GOOSENECK boom for maximum digging ranges; ability to dig hard materials; close control of dipper for precision work—These Lorain TL-20 Hoe features make it a top flight operator on deep trench excavation for sewer, water and pipe lines.

And you should see the TL-20 breeze through those small basement jobs! Working from the top, without need for ramp, this unit (1) cuts straight vertical walls; (2) levels and grades the floor; (3) digs neat, sharp corners; (4) leaves little hand trimming and (5) tops off the job by digging sewer and water line connections.



The Lorain TL-20 Hoe offers a choice of mountings—2-speed chain drive crawler, 4 or 6 wheel mobile rubber tire units with or without front wheel drive. Interchangeable boom equipment enables the "20" to switch to shovel, crane, clamshell or dragline operation in a jiffy. It's the most "versatile specialist" at work today—and you can get all the facts by asking your local Thew-Lorain distributor.

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Road Builders Urge More Federal Aid

(Continued from preceding page)

and the use of specifications flexible enough to permit the use of improved types of equipment, and the adoption of long-range and definite programs of construction that will encourage the manufacture and use of such equipment.

As to contractors, the PRA engineer argued that they "should not be complacently dependent upon the engineers to introduce cost-saving measures. Now, more than ever, they should be alert to the adoption of time-saving and economical methods of construction that have helped perpetuate the incontestable merits of the competitive contract system based as it is on individual effort and initiative."

Maintenance a Factor

Commissioner Thomas H. MacDonald of the Public Roads Administration told the conference that the highway plant of the nation that must be kept in operation daily is substantially 800,000 miles. This mileage is surfaced roads under the jurisdiction of the state highway departments and the local authorities, county and urban. It is less than one-third of the overall mileage rated as public roads.

"Continuous highway service is nondeferable," said the Commissioner, "and we can keep highways in operation only by two methods, maintenance and replacement. It must be apparent that under existing conditions, such a large construction program is extremely impracticable, and the only possibility of highway service on a continuing basis is a wise combination of intensive maintenance and a conservative construction program."

A study of comparative costs in construction and maintenance of primary and secondary roads was presented by J. S. Bright, Deputy Commissioner of the Public Roads Administration.

"From 1941 through 1946, the war and post-war period," Mr. Bright declared, "with every construction dollar expended on state highways, an additional 72 cents went for maintenance. On county and local rural roads the ratios changed even more extensively, for with every dollar expended for construction, $2.66 was expended on maintenance."

With reference to maintenance-cost trends, Mr. Bright disclosed that from 1935 to 1947 maintenance unit costs increased 71 per cent. During the same period the cost of maintenance materials rose 46 per cent and equipment charges 53 per cent. Labor cost made the greatest advancement, amounting to 98 per cent. Further analysis indicated that 48 per cent of the maintenance dollar went for direct labor, the remainder went for materials, equipment, and overhead. This is a labor cost of about $500,000,000 out of all 1947 maintenance expenditures.

European Recovery Program

How the European Recovery Program will affect domestic supplies of road-building equipment was the subject of an address by George L. Bell, Associate Director, Office of International Trade, Department of Commerce. It appears fairly certain, Mr. Bell said, that no large-scale road-building operations in Europe proper are included in the ERP, since internal freight is mostly carried either on the railroad networks or on barge canals and rivers. In Europe there is a disposition to favor rail freight over highway haulage since the railroads are generally state-owned, and their rate structures are so set as to discourage long-distance trucking operations. Hence when one small country requested 3,100 crawler tractors during the first year of its recovery program, Mr. Bell suggested "that we would want to know a lot more about how the estimate was determined".

According to the government spokesman, "crawler tractors, motor graders, and diesel engines of certain sizes constitute our present shortages, and during the first year of the Program, shortages of these items are likely to prove severe. These shortages may serve to retard, to some extent, the American road-building program, the further mechanization and replacement plans of American farmers, airport construction, and timber and building programs to the extent that the replacement of many old tractors would have to be delayed. Unless dollar shortages affect the orders from the other American Republics, manufacturers may find it difficult to satisfy the market demand from that area. During the second and especially the third year, the situation for road-building equipment should in all probability cease."

It was Mr. Bell's view that "the Program should greatly stimulate the European market for American road-building equipment, and that these gains appear to be substantial and relatively permanent. The construction-machinery manufacturers have in the past leaned heavily upon export trade for support. Thanks to past export orders the industry entered the war period in a strong position and with extensive production facilities. American equipment users can well feel they owe something to export customers in return, and so should willingly tighten their belts a little in order to make available the extra equipment needed for the success of the ERP. Should there be no reconstruction in Europe, an important mar-

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AGAINST
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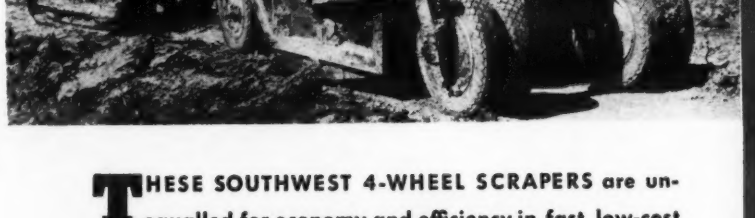

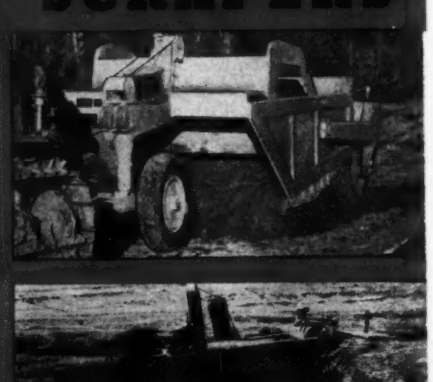

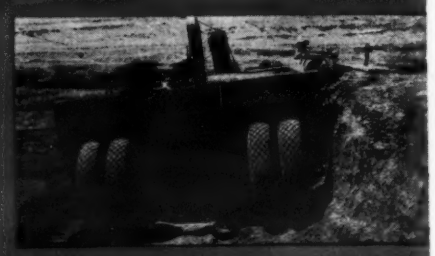

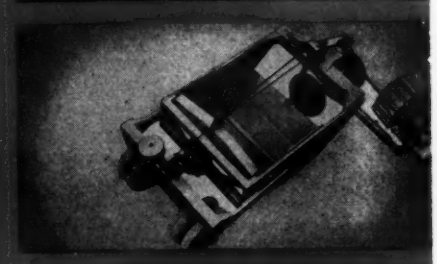

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For the past eight years these scrapers have been manufactured and distributed under license from Southwest. From now on Type "S" 4-Wheel Scrapers will be manufactured and distributed under our own trade name, "SOUTHWEST". Hundreds of these scrapers are in use throughout the world—their reputation for efficient, dependable performance is well known.

CONSTRUCTION MACHINERY DIVISION

Southwest Welding & Manufacturing Co.

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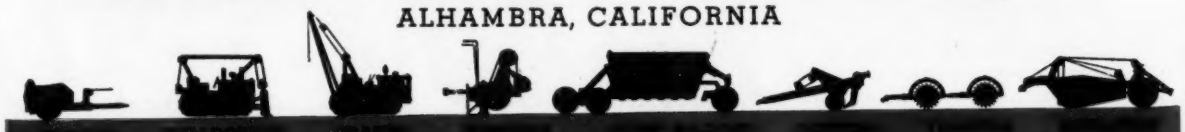

Reni Photo

A delegation from the American Road Builders' Association extends to President Harry S. Truman an invitation to attend the Road Show in Chicago, July 16-24. Left to right, they are Tom Keefe, ARBA executive, Washington, D. C.; Bert Pierce, of the New York Times, Prof. A. Diefendorf, Salt Lake City, Utah, President, Educational Division; Jennings Randolph, Washington, D. C., President, Airport Division; J. T. Callaway, Chicago, ARBA President; President Truman; Charles M. Upham, Engineer-Director, ARBA; W. B. Greene, Aurora, Ill., President, Manufacturers' Division; Donald O. White, Chicago, President, Contractors' Division; A. O. Cuthbert, Lansing, Mich., President, AILHA; George M. Shepard, St. Paul, Minn., Past President, Municipal Division.

ket for road-building products will be either lost or greatly diminished."

"The ability of the industry to deliver under the program will depend in part on the availability of certain steel products", Mr. Bell stated. "As you well know, one of the principal bottlenecks now facing the road-building-equipment industry is the shortage of certain items of steel, especially plates, while other steel items may seriously retard the production of road-building-equipment machine components."

He expressed the opinion that elaborate controls would not be required, for the equipment manufacturers could adapt their own allocation system to the requirements of the ERP. The principal controls would be required where shipments abroad were under export control.

Senator Styles Bridges of New Hampshire addressed the convention, and while endorsing a large-scale program of road construction in this country, also favored aid to Europe. However, he strongly criticized the Administration's policy of dismantling factories in Germany as running contrary to true European recovery. As an example of this policy, he related how, on a recent trip to Europe, he had witnessed the destruction of a soap factory. This was done in spite of a soap-rationing program that allocates to one person per month one cake of soap, smaller than a hotel-size bar, and in substance blown half full of air. He was also critical of State Department policies whereby on the same day two different messengers from that Department came before Congress with appeals for aid for two rival warring factions in Greece.

1948 Officers of ARBA

At the close of the three-day conference, officers and directors for 1948 were elected. J. T. Callaway, Assistant to the Vice President, Goodyear Tire & Rubber Co., Chicago, was re-elected President of the American Road Builders' Association. Capt. H. C. Whitehurst, Director of Highways for the District of Columbia, Washington, D. C., was re-elected Treasurer of the Association.

Three of the four ARBA Regional Vice Presidents were returned to office. These are: Paul B. Reinhold, President, Atlas Equipment Corp., Pittsburgh, Pa., for the Northeastern District; Charles W. Smith, President, Smith Engineering & Construction Co., Pensacola, Fla., for the Southern District; and W. A. Roberts, Vice President, Allis-Chalmers Mfg. Co., Milwaukee, Wis., for the Central District. T. E. Stanton, Materials and Research Engineer, California Department of Public Works, Sacramento, Calif., is the new Vice President of the Western District.

ARBA directors for the term ending in 1951 include Edgar J. Buttenheim, publisher, CONTRACTORS AND ENGINEERS MONTHLY, New York, N. Y.; T. H. Cutler, Chief Engineer, Kentucky Department of Highways, Frankfort, Ky.; Edward S. Gillette, publisher, *Roads and Streets*, Chicago, Ill.; Otto S. Hess, Engineer-Manager, Kent County Road Commission, Grand Rapids, Mich.; Howard R. Meeker, President, J. D. Adams Co., Indianapolis, Ind.; Charles M. Noble, State Highway Engineer of New Jersey, Trenton, N. J.; and Murray D. Shaffer, who recently resigned as Director of Highways, Columbus, Ohio, to join the Buffalo-Springfield Roller Co. of Springfield, Ohio, to act as Director of Sales and Research consultant.

Jennings Randolph, former Congressman from West Virginia and now Assistant to the President, Capital Airlines, Washington, D. C., was elected President of the Airport Division. In the Contractors' Division, President Donald O. White, The American Asphalt Paving Co., Chicago, was re-elected for 1948. Burt T. Collier, County Engineer, Coahoma County, Clarksdale, Miss., was elected President of the County Highway Officials' Division. J. B. Wilson, Director of Public Works, Louisville, Ky., was elected President of the Municipal Division. The Manufacturers' Division will hold its regular election of officers during ARBA's 45th Annual Convention in Chicago, July 16-24, 1948, concurrently with the Road Show.

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Unique Batch Plant Speeds Airport Work

(*Continued from page 1*)

cent compaction at optimum moisture content over the entire field, except under the paved areas; there a 95 per cent compaction was required. Natural moisture in the soil practically eliminated the need for adding water in the compaction operations. A 1,500-gallon tank truck with a Jaeger 2-inch centrifugal pump for applying water under pressure through a spray bar was available on the job. The water was obtained by tapping city hydrants about a 2-mile haul from the job.

As the dirt was spread out, it was compacted to the necessary requirements with from 10 to 12 passes of sheepsfoot rollers. One single-drum and four dual-drum Bucyrus-Erie units were used, generally pulled by TD-9 tractors.

The bulk of the grading was done through July, August, and September of 1946 when two shifts were worked. The 8-hour shifts were from 6 a.m. to 2 p.m. and from 3 p.m. to 11 p.m. During the hour shutdown from 2 to 3 p.m. the equipment was greased and fueled with Shell Oil Co. products. Light for the after-dark operations came from four Onan 5-kw light plants. An average of 10,000 cubic yards was moved daily in the two shifts.

Drainage

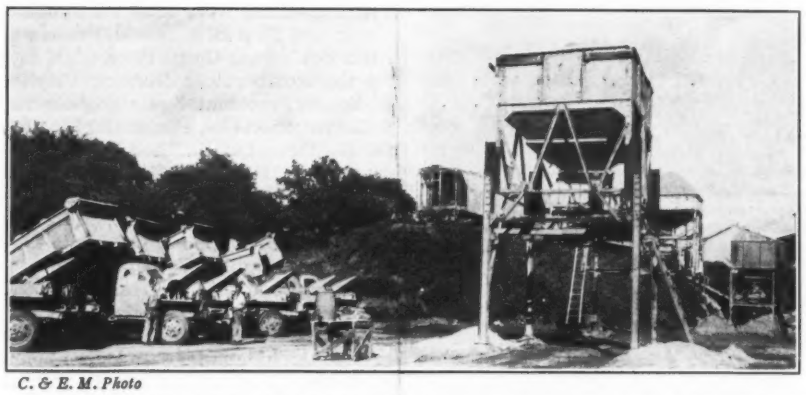
The big field is well drained with about 16 miles of pipe installed under this contract. The largest item in total length was 57,200 linear feet of 6-inch concrete underdrain. In addition, 23,760 linear feet of concrete pipe ranging from 8 to 48-inch diameter was also laid, and 49 drop inlets and 34 manholes were built. The 6-inch underdrain parallels the runways, 2½ feet off both edges, and from 2½ to 5 feet below the top of the pavement. The pipe was laid in trenches which were dug by a Buckeye ditcher. The open joints were covered with coarse gravel before the sand backfill was placed in the trench.

A Moto-Crane with a 35-foot boom and a ¾-yard bucket dug ditches for the larger pipe. So did three Lorain draglines with crawler treads — two with 40-foot booms and ¾-yard buckets and one with a 50-foot boom and 1½-yard bucket. These rigs also set the pipe. Both grading and drainage operations proceeded simultaneously. The backfill was dozed into the trenches by a D4 tractor and was compacted by three different crews. Each crew had two Worthington pneumatic tampers which were driven by 105-cfm compressors; there were three of these compressors on the job—a Worthington, Jaeger, and Chicago Pneumatic.

Granular Sub-Base

The 7-inch granular sub-base was laid under all paved areas and extends out on each side as far as the underdrain pipe. The material for the bottom 4 inches was obtained from banks in the Sangamon River, while the upper 3 inches came from three different borrow pits. In all sources the material was a sand and gravel mixture, with a somewhat better gradation obtained from the river-bank-run. The latter, however, was more difficult to obtain because of high river stages at times, which necessitated building a haul road down to the bank. The average haul from all sources was 3 miles.

The granular material was excavated by three draglines—two Northwests and a P&H—all equipped with 50-foot booms and 1½-yard buckets. When working at the river the rigs worked from the banks. Hauling was done in four bottom-dump Euclids carrying an average of 12 yards per load. The sand-gravel was spread by the graders and compacted by rubber-tire rollers.



C. & E. M. Photo

At the batch plant for the Springfield Airport, we see part of the fleet of Studebaker trucks with compartments for four batches; the Butler 50-yard bin for coarse sand, at center; and behind that, the Winslow 25-ton bin for fine sand.

All the sub-base material conformed to the following gradation:

Sieve Size	Per Cent Passing
3-inch	100
2-inch	80-100
No. 10	35-90
No. 40	5-55
No. 200	0-5

Concrete Batch Plant

While the grading was going on, the contractor was setting up his concrete batch plant. He chose the only available site where he would have access to a railroad for his raw materials, and from which he could haul his batches over a paved road to the airport. The site was small, but by grading some 10,000 yards of dirt a layout was possible whereby the materials were speedily unloaded and converted into batches with the least possible movement and delay. The lot adjoins Walnut Avenue, north of Springfield, and is crossed by a trestle of the Illinois Central Railroad which is so little used that the contractor could employ it in his batching set-up. At one end it forms a Y, with an embankment fill long enough to contain four cars of cement on its single track.

When paving operations were at a peak, a day's work consumed 8 carloads of cement, 20 to 25 cars of sand, and 45 cars of gravel. This required fast unloading and fast routing of materials from plant to pavers. Most jobs this size use two cement bins to advantage, but the Wright Construction Co. "got away" with only one by transferring the bulk cement from the cars on the embankment track to the ad-

(*Continued on next page*)

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KEEP COSTS DOWN

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presents the
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every Wednesday night.
Metropolitan Opera
broadcasts every
Saturday afternoon.

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C. & E. M. Photos

At left is the Butler 50-yard coarse-aggregate bin which Wright Construction Co. set up at its batch plant. The hopper-bottom cars on the trestle unloaded to a hopper from which the material was moved up to the bin on a Barber-Greene conveyor. Behind the trestle, shown in the other photo, was a Blaw-Knox 300-barrel cement bin which was loaded from hopper-bottom cars on the embankment through a Butler screw gear.

joining cement bin with only a worm gear, dispensing with the conventional accompanying enclosed elevator. Because of the shortage in batch-plant equipment at the time the set-up was made, the cement storage consisted of a Blaw-Knox 300-barrel bin with a Butler dual weigh-batching mechanism, and a Butler 12-inch-diameter screw 30 feet long. This screw gear was tilted upwards at a 16-degree angle from the bottom of the cement cars on the siding to the top of the storage bin. When paving was in progress and cement was being drawn off the bin, a 380-barrel car of cement could be unloaded in 20 minutes.

Air-entrained cement was used, and was furnished by the Universal Atlas Cement Co. from its Hannibal, Mo., plant. Bulk-cement cars carried the shipments to the I. C. RR siding at the Springfield batch plant. All the car switching at the plant was done with a Studebaker 6 x 6 truck using a long cable and block. Great care had to be exercised in setting up the cement bin on adequate footings, since it was astride a 16-foot sanitary sewer serving the city of Springfield. Despite the heavy traffic through the plant, the sewer line suffered no damage.

Sand and Gravel Handling

With the cement bin set up in the corner of the Y between the trestle and embankment, a Butler 50-yard dual-batcher aggregate bin was erected on the other side of the trestle for gravel storage. Gravel, from 2-inch down to ¼-inch size, was obtained from two sources—the Chicago Gravel Co. at Joliet, Ill., and the Material Service Corp. at Chicago, Ill. It was shipped in hopper-bottom cars out to the trestle which could accommodate 37 cars. At a point under the trestle opposite the gravel bin, a hopper was built to receive the material as it was dumped from the cars. From the bottom of the hopper a Barber-Greene 60-foot x 24-inch conveyor carried the gravel up to the bin, filling it from the top. The surplus ran from a chute out the side into a stockpile. A Lorain 40 crane with a 40-foot boom and an Owen 1-yard clamshell bucket also kept the bin full from the stockpile storage when the cars were not being unloaded.

Two different kinds of sand were used in the concrete mix—a fine, or blending type of sand, and a coarse, torpedo sand. The fine sand was obtained from the borrow pits and was screened so that 100 per cent would pass the No. 100-mesh sieve. Then it was hauled to the plant and either stockpiled, or stored in a Winslow 25-ton aggregate bin which was located in front of the cement bin. The coarse sand, graded from No. 10 down to No. 100, was supplied by the Missouri Sand & Gravel Co. at Barry, Ill., and was shipped in hopper-bottom cars to the batch-plant trestle.

Back down the trestle from the gravel hopper a sand unloading pit had been constructed during one week end between Friday night and Monday morning, when the railroad was not using the tracks. A concrete pit with

(Continued on next page)

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FOR ALL CONTRACTORS' EQUIPMENT

Unique Batch Plant Speeds Airport Work

(Continued from preceding page)

walls 16 feet long was built under the track, with the outer rail supported on a 24-inch I-beam span between the end walls, and the back rail resting on timbers running along the rear wall of the pit. Sand cars were unloaded at once over the pit, thus never tying up the trestle. As the material ran down into the pit to form a stockpile, it was handled by a Northwest crane with a 50-foot boom and an Owen 1¼-yard clamshell bucket. This rig worked between the fine and coarse-sand stockpiles and kept both bins charged. The coarse sand was kept in a Butler 50-yard dual-batch bin.

Eight-Bag Batches

The batch hauling was subbed out to the Gem City Cartage Co. of Dexter, Mich., which used a fleet of 18 new 6 x 6 Studebakers with body compartments for four batches each. At times these batch trucks were augmented by four other 2-batch trucks. Each of the regular fleet picked up four 8-bag batches by running first under the gravel bin, then under the cement bin, and finally under the fine and coarse-sand bins in that order. The trucks looped a figure 8 through the plant, always driving through the bins, and never having to reverse or back under a bin.

From batch plant to airport the average haul was 3 miles over a paved highway; at the airport the contractor built a short section of shale road out to the runways.

The weights of an 8-bag 1⅓-yard batch of concrete were as follows:

Cement	725 lbs.
Fine Sand	125 lbs.
Coarse sand	1,385 lbs.
Gravel	2,845 lbs.
Water	44 gals.

The concrete had a slump of from 2 to 3 inches, and weighed 151½ pounds per cubic foot.

Concrete Runways

The three 5,300 x 150-foot intersecting runways are laid out north-south, northwest-southeast, and northeast-southwest. A network of 50-foot-wide taxiways connects them with the apron area. The non-reinforced concrete was poured in 25-foot lanes, 9 inches thick on the taxiways and the final 500 feet at both ends of the runways, and 8 inches thick on the rest of the runways. Under a separate contract the Wright Construction Co. built for the City of Springfield a 9-inch concrete apron 750 feet long x 300 feet wide.

Wright Construction Co. Photo

Wright Construction Co. kept a pair of dual-drum pavers working in tandem on runway and taxiway paving at the Springfield Airport. They kept about 40 to 50 feet apart, the first depositing about half the thickness of concrete, and the second what was needed to fill the rest of the forms.

Paving operations started on August 24, 1946, with a center runway lane, and this lane was finished first on all three runways, together with half the width of the main taxiways as the initial step. This turned out to be a propitious move, for when rains soaked the field later, there was always a paved surface to reach every part of the airport. By November 20, 1946, when the job was shut down because of freezing weather, 88 per cent of the concrete was finished. Two runways were completed, and the third, the north-south runway, was about half finished. The main taxiways were also paved by autumn, with some connections left to be put in the following year. Because of the heavy rains in the spring of 1947, no paving got under way until June 12, and with continuing rains only 10 days were worked in the first month after that. The paving was finally completed in July, but the final shaping and seeding of the shoulders was not finished until September.

Paving Operations

On the job were 6,000 feet of 9-inch Metaform steel forms which had welded along the sides a 2 x 1-inch metal piece which formed the longitudinal key joint between adjacent lanes. They were set by hand on a foundation which was then compacted underneath

(Concluded on next page)

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The simple wedge clamp illustrated above holds forms together, as well as the ties between forms. This eliminates the use of nails, spreaders or band irons, and requires the use of only one wale. The forms last 50 to 100 reuses without repair.
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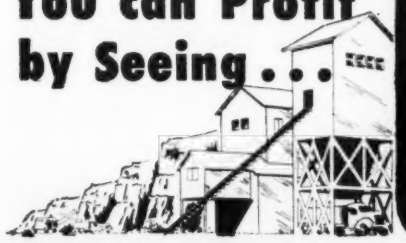
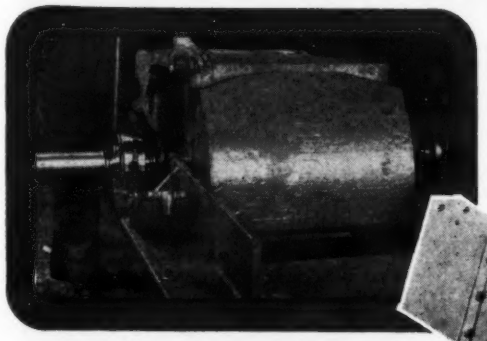


Stone Age



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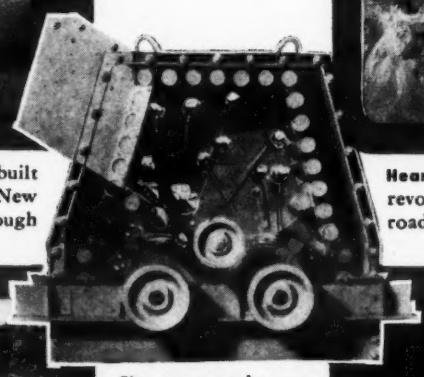

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Gentlemen:
I want to arrange for a free showing of "The New Stone Age". The most suitable time and place is . . . . . (date)
at . . . . . (address)
Name . . . . . (please print)

by a Jaeger form tamper. The subgrade was given a final going over with a Buckeye RB Finegrader which pulled along by a wire cable a Cleveland scratch template to check the depth. At the beginning of the day's run the usual procedure was to have 2,500 feet of forms and grade prepared ahead of the paving, and as the work advanced this length never was permitted to drop below 500 feet.

At 120-foot intervals Laclede expansion-joint assemblies were installed to support the ¾-inch fiber material. The latter came in two 12½-foot sections to make up the 25-foot width of lane. They were placed with the top 1 inch below the finished grade, but were capped with a metal channel having a 2-inch lip on each side which came flush with the top of the concrete as it was poured. Twelve pins were driven into the ground to keep the joint vertical. Through the joint went 1 x 16-inch dowels on 16-inch centers across the slab. Contraction joints of the same type of assembly, but without the filler, were installed every 20 feet between the expansion joints. They carried ¾ x 16-inch dowels on the same centering as those through the expansion material.

The bulk of the straightaway runway and taxiway paving was done with a pair of dual-drum 34-E pavers of which the contractor had three on the job—a Koehring, a Ransome, and a Rex. He also had a MultiFoote single-drum 34-E paver which was used on the connecting taxiways, fillets, or rounded approaches. Working in tandem, the pair of dual-drum pavers kept from 40 to 50 feet apart and were never separated by more than 100 feet so as to get a good bond between the two lifts of concrete. Tank trucks supplied water to the pavers from city hydrants. Equipment for this purpose included three 1,000-gallon tanks on Studebaker trucks, and a 3,000-gallon semi-trailer tank truck on an Autocar.

After the batches were mixed ½ minute in each drum they were discharged into the buckets which were then run out on the 35-foot paver booms and dumped on the subgrade. The front paver deposited about half the thickness of concrete while the second paver, run by a more seasoned and experienced operator, poured what was needed to fill up the rest of the oiled forms. For the first lane they worked on the subgrade outside the forms, but subsequent lanes were poured from the finished concrete.

Concrete Finishing

As the concrete was dumped it was struck off and screeded by a Blaw-Knox paddle-type spreader which was equipped with a full-width vibrator at the rear. This was followed by a Jaeger-Lakewood double-screed finishing machine. Working from a platform at the rear of this unit a worker inserted tie bars into the concrete down the center line of the 25-foot lane. The tie bars are ¾ x 30-inch, and are spaced on 30-inch centers across the longitudinal joint. They were embedded 3 inches into the concrete with a length of 2 x 4 marked with a cross piece for the proper depth.

The surface of the concrete was next screeded in a direction parallel to the forms by a Koehring Longitudinal Finisher. After that came a Flex-Plane machine which inserted strips of steel, 2½ x ¼-inch, into the concrete at the transverse contraction joints and the longitudinal center-line joints. After the concrete had set up slightly, the finishers, working from bridges, pulled these steel strips and also removed the steel caps from the expansion-joint material. They then edged around the joints and along the forms. The concrete was cured by spraying on Kapco membrane compound applied at the rate of 1 gallon for every 250 square feet. The joints were poured with asphalt filler, usually about 7 days after the concrete was laid.

The average production in a 10-hour day working two pavers was 2,000 feet of 25-foot-width concrete.

C. & E. M. Photo

Meet G. H. Cargill, Superintendent for Wright Construction Co. (left), and Fred Flick, President of the Gem City Cartage Co. which subbed batch hauling for the Springfield Airport job.

Quantities and Personnel

The major items included in the $1,628,857 contract were as follows:

Excavation	540,000	cu. yds.
Underdrain, 6-inch	57,200	lin. ft.
Granular backfill for side drains	9,000	cu. yds.
Concrete pipe, 8 to 48-inch	23,760	lin. ft.
Inlets	49	ea.
Manholes	34	ea.
Granular sub-base, 7-inch	371,000	sq. yds.
Plain-concrete pavement, 8-inch	205,000	sq. yds.
Plain-concrete pavement, 9-inch	146,000	sq. yds.

During the peak of construction the Wright Construction Co. employed 300 men. G. H. Cargill, General Superintendent, aided by Owen Bachman and Francis Wilson, night and day Grading Superintendents; Walter Meyers, Paving Superintendent; and Judson Transue, Engineer, were responsible for the handling of the construction crews. W. C. Wright and G. H. Cargill were responsible for the planning and construction of the efficient batch-plant set-up. Fred Flick looked after the hauling activities of the Gem City Cartage Co. which transported the concrete batches.

For the Civil Aeronautics Administration, Pete Scofield, Frank A. Love, and Don Miller were Resident Engineers on the contract. The project was under the supervision of the Chicago Office of the CAA, with L. M. Marriner, Superintendent, Plant and Structures Branch. George Vest is Regional Administrator.

Have you contributed to the United Nations Appeal for Children? Those hungry children need your help, so give as much as you can.

STOODY
wear protection
keeps these mighty earth movers
ON THE JOB

Wherever earth is moved, abrasion takes a heavy toll of equipment life. Unprotected parts soon need replacement—and down time is lost time.

STOODY Electrodes provide economical wear protection two ways:

By providing the right build-up electrodes for restoring worn parts to original size and shape.

By providing the one BEST hard-facing alloy for increasing equipment life far beyond normal expectancy.

FOR QUICKER BUILD-UPS Stoody Manganese Electrodes have important advantages. Fabricated construction permits ample manganese to offset any loss in burn-off. As a result, risk of brittleness from manganese deficiency in deposits is overcome. You get high build-ups with low penetration with either AC or DC application. And don't overlook its LOW COST . . . 40c per lb. in ¼" and 5/16" rod sizes.

FOR WEAR RESISTANCE Stoody makes 12 different hard-facing alloys. Each is specifically designed to combat a major wear problem. Out of this selection you're assured of the most efficient alloy for your particular need—whether it's protection against abrasion, heat, impact, corrosion—or any combination of these factors.

Write for free STOODY HARD-FACING GUIDE BOOK...shows where and how to save money on 91 varied pieces of heavy equipment!

STOODY COMPANY
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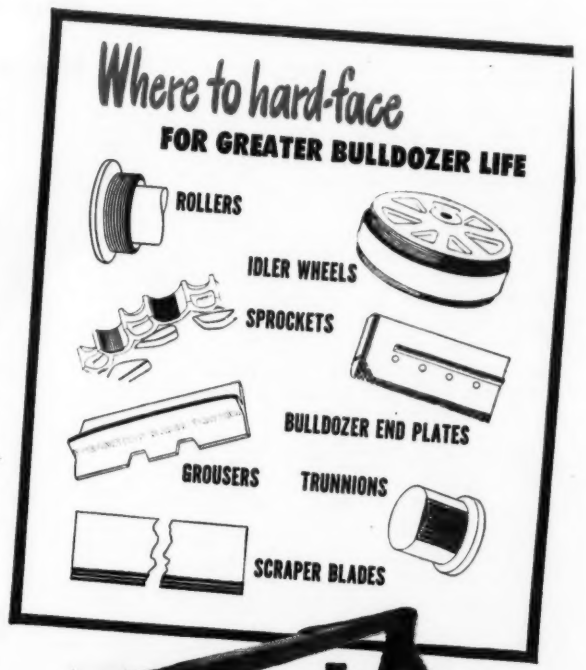
WHITTIER, CALIFORNIA

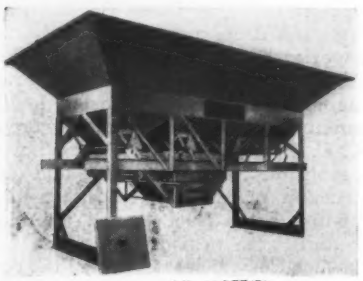


SAFETY STICKERS

Cut Down Accidents

Place these self-sticking warning signs on your equipment where your workmen can't miss them. A warning word may prevent a serious accident. SAFE-T-STIKRS are colorful, inexpensive and can be used anywhere. Write for catalog and price list. Put your safety message in front of your men.

The Howard Co. 1227-A, 20th Place, Hermosa Beach, Cal.



The new Lo-Bin batcher, featuring low overall height for easy charging, has a heaped storage capacity of 30 tons with extension panels.

Feature of Batcher: Low Overall Height

A batcher with low overall height for easy charging has been announced by the C. S. Johnson Co., a Koehring subsidiary located at Champaign, Ill. The Lo-Bin batcher is designed to serve three standard sizes of portable mixers and can be charged from stockpiles or directly from an embankment. Storage capacity of the unit, when equipped with extension panels, is 30 tons; with top panels removed, it has a truck capacity of 8 tons. Height with top panels removed is 7½ feet; with top panels in place, it is 9½ feet high.

The batcher hopper and scale-beam box are suspended from the framework, and ride on four steel wheels. The batcher can be installed in either of two directions in the bin. The hopper is cantilevered beyond the wheels and the end of the track so that it can charge a mixer skip positioned so as to clear the ends of the track when the skip swings up.

Adjustable legs lower the bin and batcher 9 inches or raise it 18 inches. With legs removed, the lower bin section measures 6 x 3¾ x 14 feet; it can be slid onto a dump or flat-bed truck. The batcher hopper capacity is 22 cubic feet—sufficient for a 16-S mixer plus a 10 per cent overload.

Sand and stone are discharged to the batcher through two large fill valves under each of the compartments. Only one of the two gates is used for weighing up a batch. The bottom slopes of the bin are set at 45 degrees.

The double 42-inch-wide discharge gates are designed to spread the material completely across the mixer skip. They are operated by a toggle lever, and when they are open they clear the ground by 20 inches, with the legs in normal position. To eliminate the need for walking under the bin, removable handles which operate the fill valves and batcher have been placed on the bin side.

Two weigh beams in the trolley batcher scale have a 1,600-pound capacity, the manufacturer states, with space provided for an additional beam if required. The major poise weight of the weigh beam drops in notches at 100-pound intervals. Minor poise can be set to 2-pound intervals. Balance point of the weigh beam is shown by a sensitive beam-balance indicator.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 32.

Officers for Toncan Assn.

R. W. Langenbach has been elected President of the Toncan Culvert Manufacturers Association. Mr. Langenbach is President of the Berger Metal Culvert Co. of Westminster, Vt.

Other officers and committee members elected are: K. A. Johnson, President of the Wisconsin Culvert Co., Madison, Wis., the retiring Association President, who will serve as Vice President; Harris R. Lunn, President of the Boardman Co., Oklahoma City, Okla., who was elected Secretary and Treasurer; and H. E. Snyder, who was elected Managing Director for 1948. L. J. Busby, Wisconsin Culvert Co., will head the Standing Committee on Products and Methods.

Care and Operation Data On Use of Fastening Tool

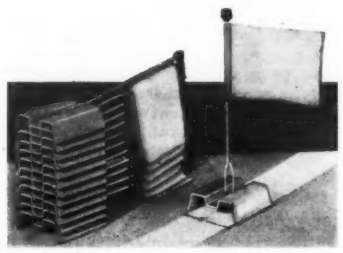
Three pieces of literature about the Tempotool, its use and care, can be secured from the Tempo Products Co., 1900 Euclid Ave., Cleveland 15, Ohio. The Tempotool is a hand tool designed to install studs and do other fastening jobs through the use of explosive charges. It is said to speed and simplify installation where it is necessary to attach steel to steel, or steel to concrete, brick, or mortar.

A 4-page folder describes the unit, its uses and specifications. It tells about the three powder loads which are available for different jobs, and lists the seven steps to be followed in using the tool. It also describes the various studs for use with the Tempotool.

Also available are two 16-page instruction and operating manuals. One covers the use of Model 122, while the other covers Model 238. The manuals tell what the tool is, list general safety precautions, show cross-sectional drawings of the tool accompanied by a parts list, give illustrated operating instructions, and tell what to do if the unit should fail to operate. They also reproduce the guarantee covering these tools and a guide chart on the use of the three powder loads.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 70.

GENERAL Traffic Line GUARDS



General Guards have proved themselves through many years of use on state highways and city streets. Their safety, speed and economy help in traffic line marking and increase highway safety for both the motorist and your maintenance crew.

Safety records show that users of General Guards have cut accidents to as low as one-half the national average. All General Guards are furnished complete with staffs and red flags, or steel base sections only.

Write for folder on how General Guards can increase highway safety.

General Road Equipment Co., Hanna Building Cleveland 15, Ohio

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MADE to close tolerances and unvarying quality standards by the world's largest manufacturer of wire rope, U·S·S American TIGER BRAND Excellay Wire Rope possesses strength, toughness and flexibility in the right combination to stand up tirelessly under long, hard service.

It is easy to handle . . . can be speedily installed. It requires shorter breaking-in period . . . has less tendency to loop, kink or whip and it hugs sheaves and drums at all speeds. And its Excellay Preformed construction offers the highest resistance to bending fatigue.

You can depend on TIGER BRAND to help reduce maintenance and line replacement costs . . . to help you do a more efficient job in any operation calling for quality wire rope. That's why the Big Demand is for TIGER BRAND. See or call your supplier today.

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UNITED STATES STEEL

EXCELLAY PREFORMED

THE BIG DEMAND IS FOR TIGER BRAND

A truck delivers sandy loam and cement (first photo), while a tank truck delivers emulsified asphalt and water, for Arkansas Mud-Jacking. One man shovels soil and cement into the Mud-Jack hopper (second photo), while the other regulates slurry consistency. The slurry is pumped into the subgrade through a hole drilled in the pavement (third photo).

Asphalt Used in Mix For Mud-Jack Work

Addition of Emulsified Asphalt to Soil-Cement Slurry Mix for Raising Concrete Slabs and Correcting Joint Pumping Improves Results

By C. C. WHITE, State Maintenance Engineer, Arkansas State Highway Commission

✦ THE jacking up and leveling of old concrete pavements and the correction of pumping at joints has been, and is now, one of Arkansas' major highway-maintenance problems. Considerable pavement break-up and joint pumping have taken place on almost all of the state's routes that are of any consequential age.

The primary causes for this are bad soil conditions, lack of proper subgrade drainage, improper design of the old pavements in view of present-day traffic densities and weights, and lack of intensive maintenance during the war period.

Prior to the past eighteen months, Arkansas maintenance forces had been using a soil-cement slurry to raise and level these old concrete pavements. The slurry consisted of 1 cubic yard of sandy loam, 3 bags of portland cement, and enough water to produce a slurry of the proper consistency for the particular job.

It was found, however, that this slurry mix did not give the final results desired; that while its use provided brief temporary relief, it was soon broken down by absorption of moisture and the continuous application of traffic loads.

Emulsified Asphalt Used

In an effort to find a more suitable mixture of materials for the purpose, it was decided to introduce emulsified asphalt into the slurry in order to produce, finally, a semi-plastic waterproof material for leveling and undersealing deteriorated sections of pavements. Several different combinations were tried over a period of a year, until a satisfactory combination was arrived at and adopted. It consists of 1 cubic yard of sandy loam, 1 bag of portland cement (2 bags during the winter months), 65 gallons of emulsified asphalt, and enough water to produce a slurry of the proper consistency.

How the Work Is Done

This maintenance operation is usually handled by an eight-man crew. The sandy loam and cement are delivered by a truck to the site of the work, where one man hand-shovels the materials to the hopper of a Mud-Jack. The emulsified asphalt and water, suppled by tank trucks, are introduced into the mixing chamber through hose from the supply tanks to the Mud-Jack. By constant inspection and by regulating valves, the operator controls the consistency of the slurry mixture.

Holes are drilled in the pavement as necessary, and the slurry is pumped through a hose and nozzle into the sub-

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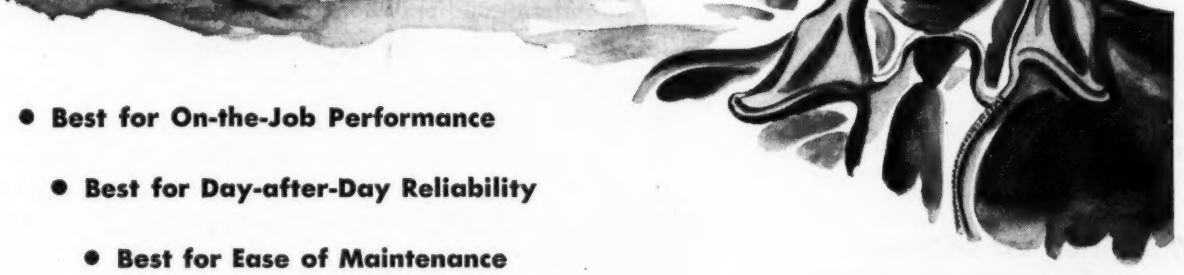

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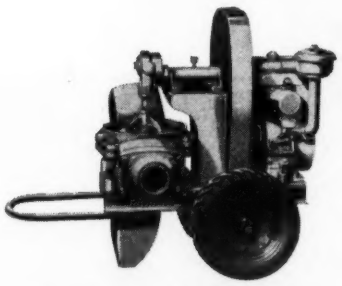
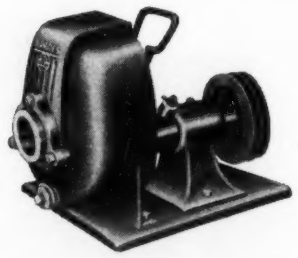
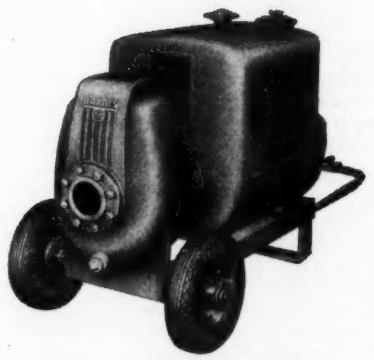


Lift-and-Force Single Diaphragm Pump
Lighter in Weight, 300 lbs. More Compact for Faster Handling. Simplified Design for Easier Servicing.



Barnes Universal Drive Pumps
Driven from Power Take-Offs of Tractors, Existing Gas or Diesel Engines Directly Coupled to Electric Motors.



Barnes "33,000 for 1" Automatic Centrifugal Pumps
Pumps 33,000 gallons of liquid for only 1 gallon of gas. Capacities from 3,000 to 90,000 G.P.H.

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Please send me descriptive literature on pumps marked below:

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1737 Farragut Ave. Chicago 40, Ill.

An 8-man crew usually handles Arkansas Mud-Jacking. The two men in the foreground are standing on a protective shield which keeps the slurry from spattering. The helper behind them cleans up any slurry that is spilled.

Asphalt Used in Mix For Mud-Jack Work

(Continued from preceding page)

grade. A protective shield, as shown in the illustration, keeps the slurry from spattering on the workmen and surrounding pavement. Any excess slurry which is spilled is removed from the pavement at once by a helper.

Results Obtained

It has been found that the emulsified asphalt tends to lubricate the slurry mixture; thus it prolongs the life of the slurry pumps and reduces friction of the base. The use of the emulsified asphalt has also been found to suspend the sand particles, and thus make less critical the sand content of the soil used in the mix.

Numerous bar shrinkage tests have been made of this emulsified-asphalt mixture, with a result of less than 1 per cent shrinkage factor on all specimens taken. The Bitucote emulsified asphalt used meets specifications for Arkansas AE-2, which is essentially the same as The Asphalt Institute specification SS-1.

Several of the most heavily traveled portland-cement concrete highways in Arkansas have been treated with the emulsified-asphalt-soil-cement slurry during the past year. Excellent results have been obtained. In numerous instances, only one treatment has been necessary to make what appears to be a permanent repair.

Machines for Making Concrete Products

A line of equipment for use in concrete-products plants is manufactured by The Kent Machine Co., Cuyahoga Falls, Ohio. It includes batch mixers, continuous mixers, Stediflo mixers, tampers and strippers, Vibra-Tamp block makers, Lintelators, concrete elevators, aggregate feeders and elevators, pallet dunkers, pallets, lift trucks, etc.

The Kent batch mixer is available in six capacities—12, 18, 24, 30, 42, and 50 cubic feet, computed from below the paddle shaft. Features claimed for these mixers include oversize shafts; dust-proof anti-friction bearings; heavy all-welded drums; hard abrasion-resisting renewable bar liners; cut, stub teeth on gears and pinions; mixer blades properly curved to apply good shovel action to the aggregate and to maintain equalized distribution and blending; and a large discharge door controlled by a lever with a positive locking-cam action.

The Kent continuous mixer is designed to provide a constant flow of properly mixed concrete. It is said to handle automatically the operations of measuring, dry mixing, watering, wet mixing, and discharging—provided the hoppers are kept filled with sand and cement. The Kent mixers are made in 3 capacities: 5, 8, and 20 cubic yards of rammed concrete per hour.

The concrete elevators are designed to carry the mixed concrete from mixer to block machine and are available for operation with the batch type of continuous mixers. The Vibra-Tamp is an automatic block maker which combines vibration and tamping, and features push-button control. It is said to produce 300 blocks per hour. The Lintelator is an air-operated machine for producing concrete lintels of 8 x 8, 7¾ x 7¾, or 6 x 6-inch cross sections in any lengths up to 6 feet.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 11.

Oil-Clarifier Literature

Descriptive literature on its line of cartridge-type oil clarifiers has been prepared by W. G. B. Oil Clarifier, Inc., Kingston, N. Y. It covers the various models and styles made by this company, and lists pertinent data and prices.

The Clarofiers are made in sizes ranging from the 75-cubic-inch unit to the Model DDS-100, which uses two 225-cubic-inch cartridges making a total capacity of 450 cubic inches. The Model SSS-100 uses two 187-cubic-inch cartridges making a total of 374 cubic inches. And Model CTL-100 uses two 162-cubic-inch cartridges making a total capacity of 324 cubic inches.

Other information provided by this literature includes a description of the various W. G. B. replacement assemblies, fuel-oil clarifiers, flexible oil lines, replacement parts, drilled-through bolts, small fittings for use with the clarifiers, parts assemblies, etc. Also described are kits which the company has prepared and which contain all parts—with or without the clarifier—needed for motor-mounting installations in general.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 54.

Eastern Office Relocates

Its eastern regional offices have been moved to Philadelphia, announces The Jaeger Machine Co., Columbus, Ohio. The new office, located at 1504 Widener Bldg., is under the direction of Regional Manager L. T. Phillips. Headquarters relocation will not affect the regional boundaries or distributors' territories in any way.

MORE PROFITS pe
yea
HEAVY-DUTY excavator

YOU get steady performance, cut maintenance delays and expense, save plant schedule readjustments, insure customer satisfaction, by using Koehring HEAVY-DUTY excavators. They are tough, long lived, built simple and handy to encourage good operator care and preventative maintenance. See your Koehring Distributor before you buy.

The Koehring 605, 1½ yard as shovel, is big and strong, ideal for rock excavation, with its heavy-duty shock absorber mounted shovel-boom. Mounted on Koehring self-cleaning crawlers, available in various sizes. Koehring 605 Cranes are equipped with a high A-frame which can be lowered or raised by power. The 605 is easily converted from shovel to crane, or dragline.

The Koehring 304, ¾ yard as shovel, with hig
operating speed and Koehring constructio
gives you durability and increased productio
You can get the Koehring 304 either crawle
mounted, or rubber-mounted as Cruiser Cra
or truck crane for greater mobility. Front en
on crawler and truck models can be quickly a
easily changed for shovel, pull shovel, draglin
or crane operations.

The Koehring 205, ½ yard as a shovel, featur
independent traction for greater speed and m
bility and a 2 in 1 shovel boom for both sho
and pull shovel work. Heavy-duty constructio
ease of operation, speed and maneuverabil
of the 205 gives you a money-making excav
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or crawlers and is easily converted to sho
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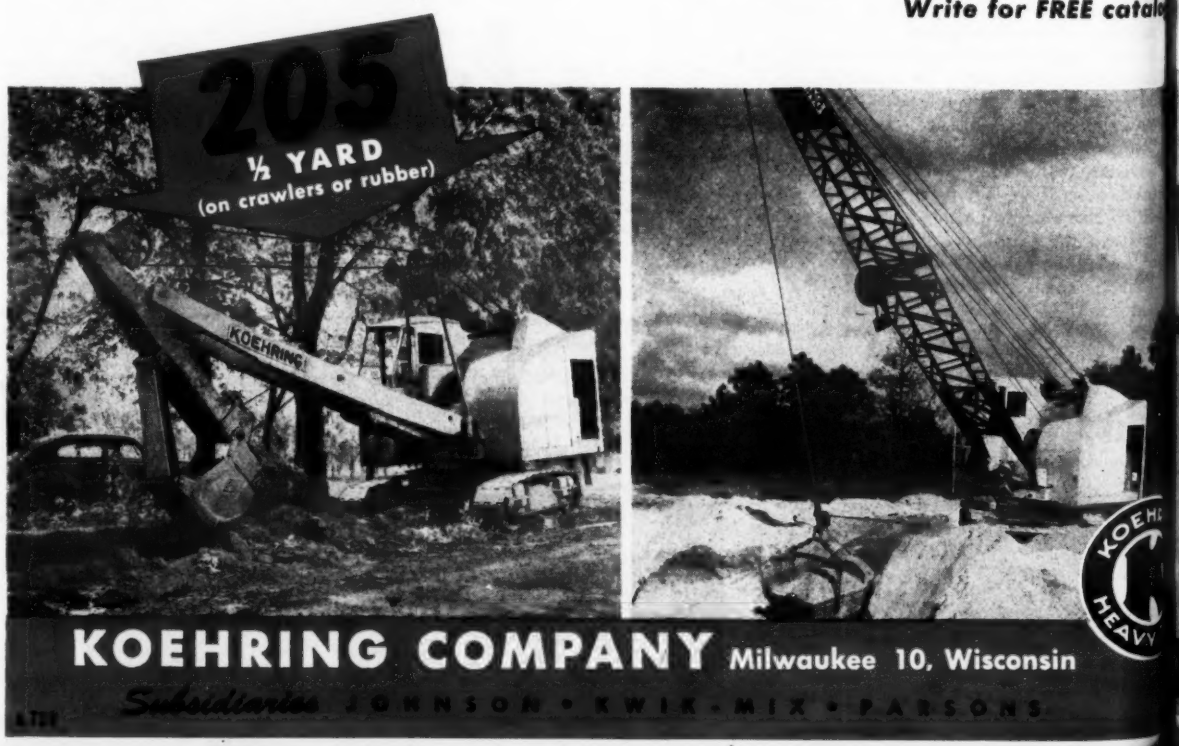


Servicing Equipment Mounted on a Trailer

Equipment for servicing mechanized units on heavy-construction jobs has been mounted on a specially built trailer. Jax, Inc., 4925 Friendship Ave., Pittsburgh, Pa., has begun production on the unit, which is known as Kilroy.

The machine is divided roughly into three main parts. The central portion consists of the fuel tanks built into the channel members and trailer chassis. Two batteries of nine hose reels are located on each side of the tank assembly for dispensing diesel fuel, gasoline, water, diesel lube oil, gasoline lube oil, air, chassis grease, track roll, and gear oil.

All operations from fueling to filling radiators are air-controlled and operated, from a 60-cubic-foot gasoline-driven air compressor. Explosion-proof air motors dispense both fuel and lubricants. And, by means of pressure regulators on each of 18 service outlets, pressure ranging up to 7,000 psi may be maintained on individual outlets, the manufacturer states. The air compressor is also used to fill the fuel reservoirs.

The equipment is mounted on a 21-foot-long semi-trailer designed to be hauled at high speed by any truck-type tractor. It has a gross vehicle weight of 18,000 pounds, of which about 7,000 pounds is fuel and lubricant pay load. It will hold 700 gallons of gasoline and diesel fuel, 200 gallons of oils and greases, 60 gallons of water or anti-freeze, quantities of kerosene, and compressed air for tires and other uses. Kilroy was designed by John H. Adler.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 48.

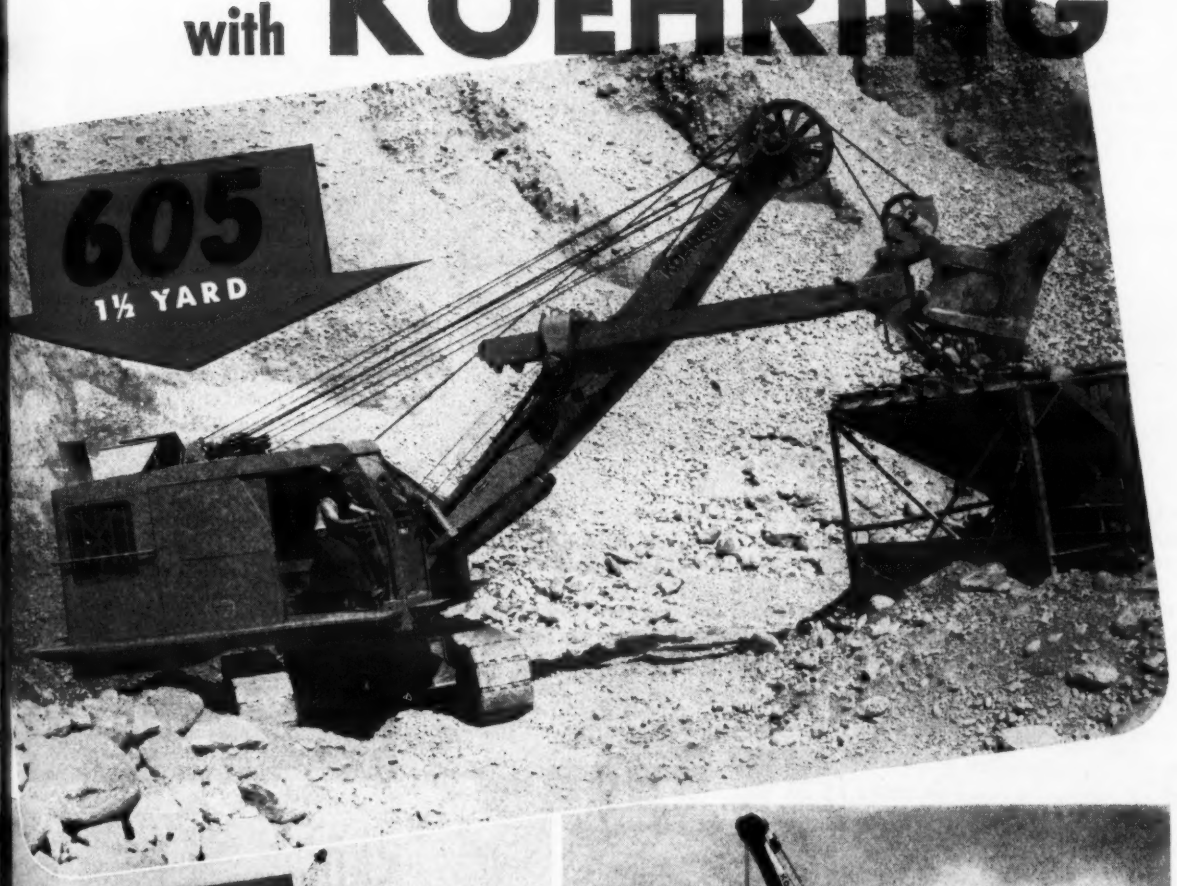
Kilroy, a trailer-mounted servicing unit, will hold 700 gallons of gasoline and diesel fuel, 200 gallons of oils and greases, 60 gallons of water or anti-freeze, quantities of kerosene, and compressed air. It is shown here with its inventor, John H. Adler, who called it Kilroy because of its mobility and because he believed that ex-G. I.'s would, in great part, man these machines.

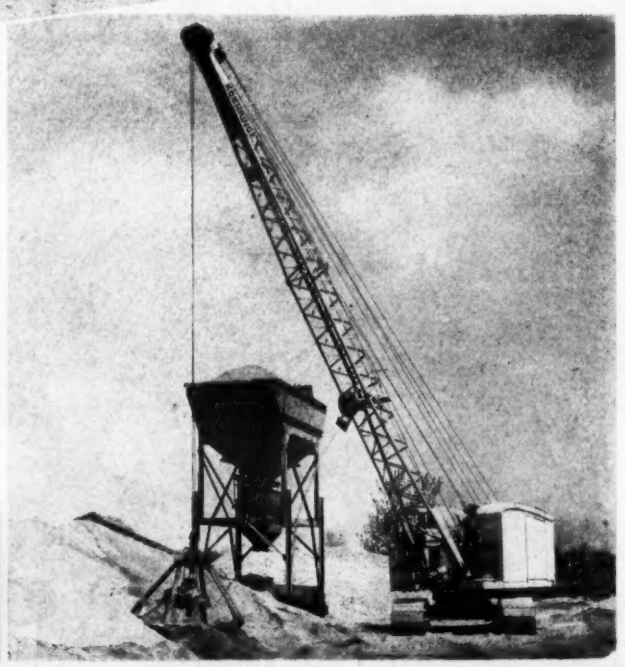
Pa. Dealer for Caterpillar

Cleveland Bros. Equipment Co. has been appointed dealer to serve 32 Pennsylvania counties for the Caterpillar Tractor Co., Peoria, Ill. The dealer's main office is located at 730 So. 10th St. in Harrisburg, and a branch is maintained at 265 Charles St. in Luzerne. This territory was formerly served by branches of the Beckwith Machinery Co., which will continue to serve in western Pennsylvania and parts of West Virginia and Ohio. Beckwith retains its main office in Pittsburgh, with a branch office located at Bradford, Pa.

Counties included in the new distributor's territory are those of Tioga, Bradford, Susquehanna, Wayne, Pike, Monroe, Carbon, Schuylkill, Dauphin, Lebanon, Lancaster, York, Adams, Franklin, Fulton, Huntington, Center, Clinton, Lycoming, Sullivan, Wyoming, Lackawanna, Luzerne, Columbia, Montour, Northumberland, Union, Snyder, Mifflin, Juniata, Perry, and Cumberland.

MORE HOURS per shift with KOEHRING





New Drill-Press Line Made in Two Models

The addition of a 14-inch drill press to its line of lathes has been announced by the South Bend Lathe Works, 114 E. Madison St., South Bend 22, Ind. It is made in both a floor and a bench model. Features claimed for this unit include a built-in light with independent switch to provide shielded illumination for the work area; and a quick-acting belt-tension release lever for changing the spindle speeds and returning the vertical-mounted motor to its original position after each change.

The spindle has a maximum travel of 4 inches, with spindle speeds of 707, 1,305, 2,345, and 4,322 rpm. Its free-floating design is said to prevent misalignment, side thrust, and whip. The depth gage is graduated in sixteenths of an inch, and has adjustable collars to control both the depth of feed and the length of the return stroke. The bench model has a 10⅞-inch maximum chuck-to-table distance. The floor model has a 40⅛-inch maximum chuck-to-table distance. The press is supplied with or without motor. A ⅓-hp 1,725-rpm vertical-mounting type of motor is recommended by the company. An on-off switch, motor-line connection cord, V-belt, motor pulley, as well as 0 to ½-inch-capacity chuck are standard equipment.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 6.

Diesel-Powered Equipment

Literature describing its line of diesel engines and diesel-powered equipment is available from Hallett Mfg. Co., 605 S. Redondo Blvd., Inglewood, Calif. This equipment includes low-hp diesel engines, diesel pumping units, diesel electric-generating sets, and marine diesel engines. A separate folder is devoted to each of these.

The folders show a picture of each model, list its features and its complete specifications, and describe the accessories and attachments available for use with it. Engineering formulae and data are included to help the reader select the proper size and style of equipment to fit a specific need. This equipment is made in a wide variety of sizes and capacities; complete details are given in the folders.

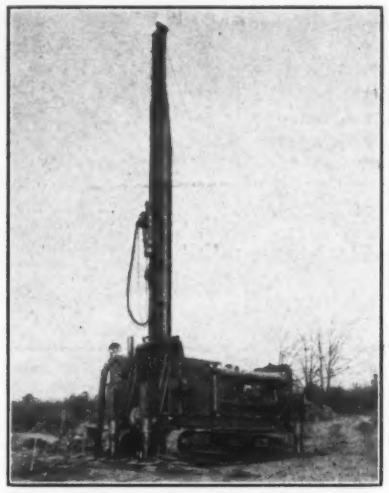
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 62.

Track-Mounted Drill Is All Air-Operated

A self-propelled rock drill designed to drill holes up to 6 inches in diameter and to depths of 70 feet was recently demonstrated by the Ingersoll-Rand Co., Phillipsburg, N. J. Four features are claimed for the Quarrymaster: (1) fast drilling, (2) controlled power feed, (3) automatic rotation of the drill bit, and (4) continuous hole cleaning. It is a self-contained unit which consists of a drill, compressor plant, propulsion equipment, and accessories.

Heart of the machine is its air-operated piston-type drill designed to strike more than 200 blows a minute. According to the manufacturer, a patented valve action and power cycle insures maximum efficiency and drilling speed; and maintenance is reduced to a minimum by using a cushion of air to bring the piston to rest before it can strike the front head. Feeding of the drill is accomplished by an air motor which drives the feed chain. A throttle located in the machine's cab allows the operator close control over the drill feed—a feature which is particularly important when drilling through slips and seams where a close degree of regulation is necessary. A drill-steel centralizer guides the drill steel until the bit is well started.

The drill rotates on the up-stroke to insure its hitting a new spot each time it descends. This rotation is said to be controlled so that the bit will cut with maximum efficiency. This makes the Quarrymaster a rock-cutting rather than a rock-crushing machine, Ingersoll-Rand explains. Chips are removed by passing compressed air down through the hollow drill steel, to force



The tower on the Quarrymaster drill has just been raised to drilling position by using the power of the feed motor. Notice the wire-rope sling over the piston drill, which passes over grooved pulleys at the base of the tower to anchor on the body of the frame.

the cuttings up to the surface through the space between the steel and the walls of the hole. When the cuttings reach the surface, they are gathered up by a motor-operated dust collector. The purpose of this hole cleaning is to insure that the bit hits rock on each stroke, instead of dissipating part of its power by cutting through previously cut chips which have remained at the bottom of the hole.

Air is supplied by an Ingersoll-Rand KA-500 Mobil-Air compressor. The crawlers are powered by air motors to permit the Quarrymaster to be spotted in the position desired. The unit can travel at speeds of up to 1 mph, and up inclines of 30 per cent. Four independently controlled hydraulic jacks are used in leveling the machine. The tower of the unit is raised or lowered by using the power of the feed motor.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 97.

Instruments for Surveying

Catalogs describing its line of surveying instruments have been prepared by The Brunson Instrument Co., 1405 Walnut St., Kansas City 6, Mo. They describe the No. 45 engineer's dumpy level, the No. 55 wye level, the No. 50 engineer's transit, and the No. 60 builder's level.

These folders describe the instruments in detail and list several features of construction and operation. Where necessary, drawings illustrate and amplify the text. The specifications are broken down according to the component parts of the instrument, and each of these is covered fully. The final page of each folder gives a partial list of the Brunson line of precision surveying instruments which includes, in addition to the levels and transits, tripods and rods.

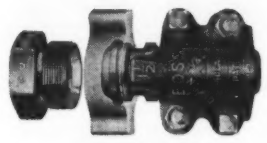
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 52.

New Western Representative

Robert C. Dunbar has been named West Coast Representative for the Small Products Division of the American Hoist & Derrick Co., St. Paul, Minn. This division merchandises the Crosby clip and American blocks and sheaves, as well as the American Handi-winch.

Quality THAT MEANS MAXIMUM SERVICE, SAFETY AND ECONOMY

The design, workmanship and finish of the couplings described below combine to assure unequalled service efficiency with important savings in hose replacements costs.



"G J-BOSS"
GROUND JOINT, STYLE X-34
FEMALE HOSE COUPLING

For all high or low pressure steam, air and fluids, including oil, hydraulics, butane, etc. Washerless construction provides a leakproof, soft-to-hard metal seal between stem and spud. Malleable iron "Boss" Offset and Interlocking Clamp exerts powerful, full-circumference grip on the hose—proof against blow-offs. Cadmium plated—rustproof. Sizes ¼" to 6".

Note: For washerless couplings of otherwise identical design, specify "Boss" Female Couplings, Style W-16.

"BOSS" MALE COUPLING
STYLE MX-16

Companion coupling to both the "G J-Boss" and "Boss" Female Couplings. Corrugated stem has strong hex section for wrench and collar to engage extensions on clamp segments. Clamp is efficient "Boss" Offset and Interlocking construction. Sizes ¼" to 6", with each size fitting same size straight end hose.

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IT'S DEPENDABLE

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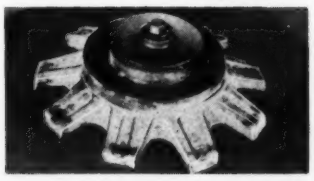
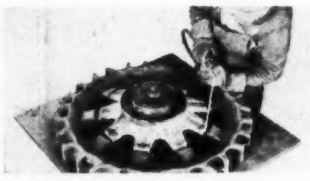
3 steps to increased service life and greater profits

1 DON'T THROW AWAY SPROCKET OR IDLER WHEEL RIMS LIKE THESE
The rims are worn out, but the hubs and spokes are sound and may be re-rimmed many times at a substantial saving.



2 EXPENSIVE HUBS AND SPOKES ARE SAVED
Any experienced welder can remove the old rim and install a new one in a short time—right on the job if desired.



3 YOU OBTAIN A NEW, TOUGH, WEAR-RESISTANT MANGANESE STEEL DRIVE SPROCKET OR IDLER WHEEL RIM LIKE THESE
They last longer under severe service and cost about half what a new sprocket or idler wheel would cost.

Pacific Rims

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MANGANESE STEEL
Drive Sprocket and Idler Wheel Rims
For Caterpillar Track-Type Tractors

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Alloy Steel & Metals Co.

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Selling Used Equipment?
Advertise it in the "TRADING POST"
See page 107

Buying Used Equipment?
Read the "TRADING POST"
See page 107

Dewatering Plan Protects Building

Ground-Water Table Below Power Plant Rises 6 Feet To Pose Unusual Job of Permanent Dewatering

+ A SEMI-PERMANENT dewatering system, involving problems in electrolytic deterioration and metallurgy, is being installed at the Terminal Island property of Southern California Edison Co., Ltd. It will control a rising ground-water table at the Long Beach Steam Station. John W. Stang Corp. of Los Angeles is handling the installation under a subcontract with Macco Corp. of Clearwater, Calif.

The cost of the dewatering layout of pumps, wellpoints, headers, electric lines, and other controls is $64,784.

Solves Unusual Problem

The installation of a dewatering system was considered advisable by W. L. Chadwick, Manager of Engineering for Southern California Edison Co., when ground water rose to within 3 feet of the ground surface. This rise of over 5 feet subjected underground structures and conduits to undesirably large hydrostatic pressure and the possibility of flooding by seepage water. For some years an approximately circular area about 6 miles in diameter in the Terminal Island area has been settling. The central portion of the area has been settling at the rate of about one inch per month. The Edison power-generating buildings, situated in this central area, have settled about 7 feet to an elevation close to high-tide mark.

While excavating for an 88,000-barrel fuel-oil tank on the grounds a year ago, it was necessary to dewater the foundation with wellpoints. When the suction pumps started operating, Edison's engineers noticed that the water level in a permanent pool about 1,100 feet away began to draw down. This phenomenon gave some favorable indication, at least, that large-scale dewatering might be the solution to the problem. After consultation on the matter, plans were drawn up and the contract was awarded.

Will Dewater Entire Area

The dewatering system will lower the water table by 6 feet in the center of a 1,000,000-square-foot area. Preliminary tests indicate that the wellpoints may be much more efficient in the immediate area of the riser pipes, thus creating a permanent convex water lens with its highest point near the center of the Edison Co. grounds.

Two 12-inch control and observation wells were drilled in the center of the area to house the floats and electric switches which will automatically actuate the pumps. Equipment installed under Stang's subcontract is designed to maintain the ground-water level permanently about 8 feet below the ground surface.

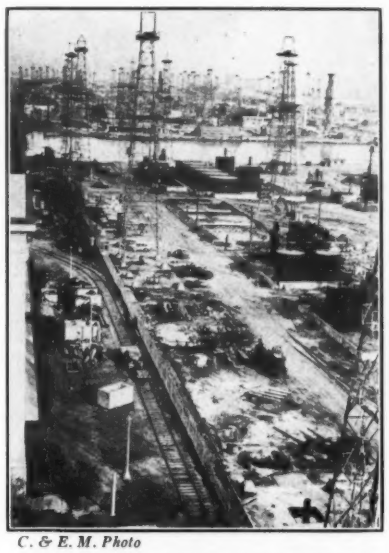
The system consists of a U-shaped continuous header placed along the property lines, and sectionalized in 300-foot increments. Riser pipes, specially designed wellpoints, and three suction pumps were installed.

Equipment Used

The three Stang pumps installed under this contract are a single-stage self-priming centrifugal type. Auxiliary oil-sealed vacuum pumps are connected to an air separation chamber built integrally with the pump. Pump cases and impellers are made of cast iron.

The Stang pumps operate at 1,150 rpm, with a 20-hp 3-phase General Electric 50/60-cycle motor furnishing the motive power. These pumps are designed to deliver 1,100 gpm against a

(*Concluded on next page*)



C. & E. M. Photo

The Terminal Island area, which has gradually been settling, looks like this from the top of one of the power-generating buildings.

C. & E. M. Photo

A workman examines one of the 12-inch inspection and control wells drilled in the Terminal Island property of Edison Co. It houses the floats and electric switches which actuate the pumps.

WON'T QUIT
or cause time out

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

•

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32-36 Dey Street
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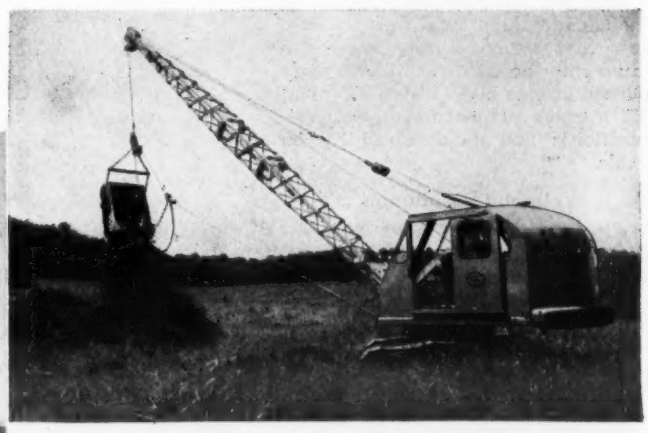
You'll be Out Ahead
WITH
MICHIGAN

MODEL T6K — ⅜ Yd., 6-Ton

Michigan rubber tired truck shovels are famous for speed on the road and on the job. Designed as a unit, with a heavy frame built for the job. Plenty of power gives you 30 mph road speeds. Easy operating air valves control air ram clutches for speedy crowding, hoisting and a 5.5 rpm swing that means extra yardage.

MODEL TMDT-16 — ½ Yd., 10-Ton

MODEL TLDT-20 — ½ Yd., 12-Ton



MODEL C-16 — ½ Yd., 8-Ton

For those swampy jobs the model C-16 — balanced weight distribution — wide pads — low ground pressure — air controlled mechanism, travel and steering.

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Get the complete details about the entire line of MICHIGAN Mobile SHOVELS-CRANES.

MICHIGAN POWER SHOVEL COMPANY
490 SECOND STREET • BENTON HARBOR, MICHIGAN

Dewatering Plan Protects Building

(Continued from preceding page)

35-foot head under 60-cycle operation. They are rated at 660 gpm on a 29-foot head under 50-cycle operation.

In order to combat electrolytic deterioration, which will be a permanent problem of the system, electrolytic traps were installed within the pump casings. Zinc cartridges, installed in the traps from time to time, will permit the electrolysis of metal without damage to the pumps.

The main headers are new wrought-steel pipe, 8 inches in diameter, and weigh 19.7 pounds per running foot. The insides of these lines were coated with Bitumastic 70-B coal-tar enamel prior to installation.

Riser pipes 15 feet long, which carry the water up to the header on 5 and 10-foot intervals, are made of Type K extra-heavy hard copper, with wall thickness of 0.072 inch. The 1½-inch riser pipe has a weight of 1.362 pounds per foot.

Wellpoints, also made by the Stang Corp., consist of a top casting, bottom casting, core, screen, and jacket. Top and bottom machined castings are of pure copper. The wellpoint core is made of pure-copper pipe. The screen and jacket of each wellpoint is also of pure copper, to insure long life under grueling service.

At the top of each riser pipe a Bakelite insulating coupling was placed. Replaceable electrolytic traps of zinc, installed in the header within 2 feet of each swing connection, will control electrolysis of the header. Two such traps were also installed in each 20-foot length of header pipe.

At the time the project was visited, soil-sample studies in nine test holes were under way but incomplete. These studies were to determine the size of wellpoint filter screens, and filter media. It had previously been found, however, that the soil underneath the power buildings was about 100 feet deep, and comprised a river delta deposit of fine sand and silt with occasional lenses of soft clay. Samples taken at the site showed the gradation given in the following table:

Screen Size	Per Cent Passing
¾ inch	100
⅜ inch	85
No. 8	81
No. 14	77
No. 28	73
No. 48	58
No. 100	25
No. 200	9

Samples of the ground water 30 feet below the ground surface showed a sodium chloride content of 25,000 ppm; a methyl orange alkalinity of 320 ppm; a 7.2 average pH (hydrogen ion concentration); and no dissolved carbon dioxide.

Wellpoint Installation

Wellpoints and riser pipes were installed inside a jetted 6-inch casing. The space around each wellpoint and its riser pipe was then filled with pervious gravel, and the casing removed. When all the wellpoints, headers, and pumps were installed, the system was then tested and put in use.

C. & E. M. Photo

The Stang wellpoint equipment shown here was used for some dewatering in connection with tunnel extension work. The semi-permanent system installed for the Edison Co. is like it, but is made of pure copper for longer life.

Personnel

The project was conceived by W. L. Chadwick, Manager of Engineering for Southern California Edison Co., Ltd., and is under his supervision, with R. W. Spencer as Chief Civil Engineer, K. A. Reeder as Structural Engineer, and T. M. Leps as Soils Engineer.

John Stang is in general charge of all work under his subcontract.

Shifts in Gar Wood Set-Up

Several changes in its sales and manufacturing organization have been announced by Gar Wood Industries, Inc., Wayne, Mich. E. B. Hill has been promoted to the position of General Sales Manager, and R. F. Whitworth has been named General Service Manager. Promoted to Regional Managers for four domestic regional sales offices are Ross Miller, San Francisco, western region; A. C. Berg, Wayne, Mich., central region; W. G. Barrett, Boston, northeast region; and H. C. Hatch, Washington, D. C., southeast region.

The corporation has also consolidated its operations into three basic divisions. The Findlay Division, Findlay, Ohio, will assume the manufacture and distribution of Gar Wood tractor equipment—scrapers, bulldozers, and rippers—as well as Buckeye construction machinery—shovels, ditchers, finegraders, and spreaders. The Wayne Division, Wayne, Mich., will continue to manufacture and distribute Gar Wood truck equipment — hoists, bodies, winches, cranes, and tanks. And the St. Paul Division, Minneapolis, Minn., will manufacture and distribute St. Paul hoists, bodies, and truck patrols.

J. D. Towne has been appointed Division Manager, and W. S. Blakeslee was promoted to Sales Manager of the Wayne Division. Promotions to District Manager were also announced for H. N. Nelson, B. A. Cooper, E. R. Curry, W. D. Kerrick, R. J. Palmer, R. M. Steegman, D. C. Royce, and W. R. Karll.

New Multi-Fuel Engine

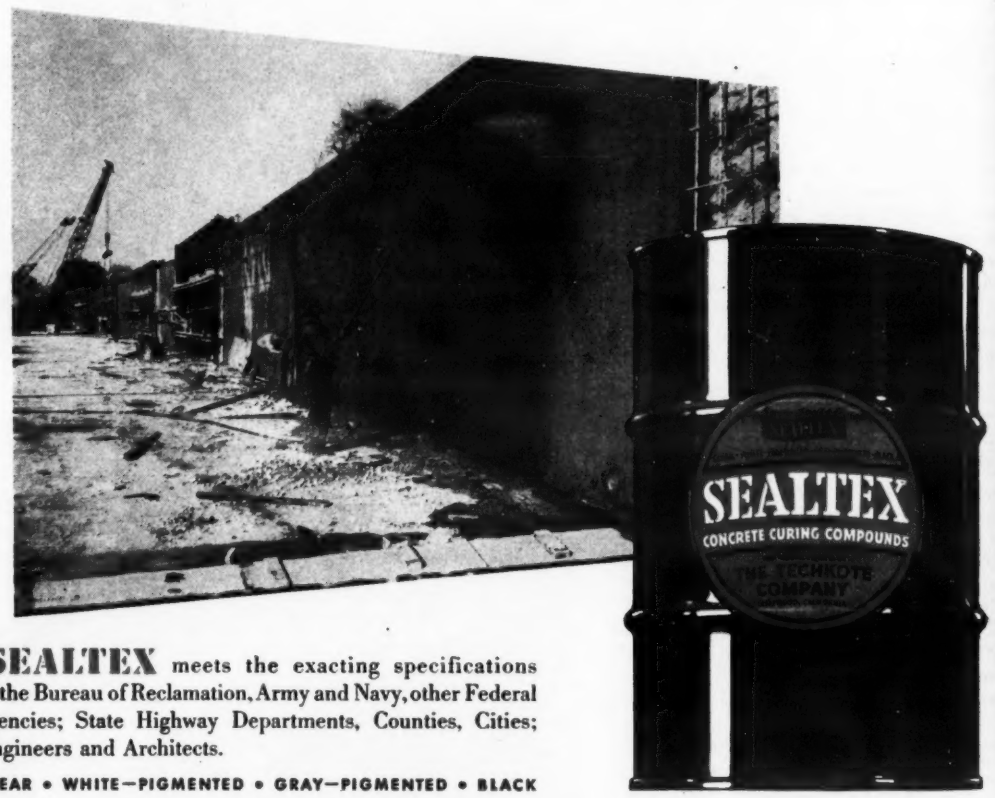
A new single-cylinder two-cycle multi-fuel horizontal engine has been announced by the White-Roth Machine Corp., Lorain, Ohio. The Lorain Type O engine is rated at 34.3 hp at 450 rpm. It is manufactured as a companion power plant to the Lorain Type L engine.

The engine may be operated as a cold-starting full diesel, or converted to burn natural gas or butane as fuel. Conversion is easily accomplished in the field, the manufacturer explains. It has a 9½-inch bore and 10-inch stroke, and is equipped with Timken bearings on both crankshaft and crosshaft. The wet-sleeve-type cylinder liners are made of alloy cast iron.

Standard equipment includes Twin Disc clutch, Pierce governor, Air-Maze oil-bath-type cleaner, and McCord lubricator. The condenser-type cooling system is designed to eliminate the need for a water pump, and to keep the amount of make-up water at a minimum. Dimensions of the Type O are: 59 inches high, 88 inches long, and 58 inches wide. Shipping weight is 3,800 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 20.

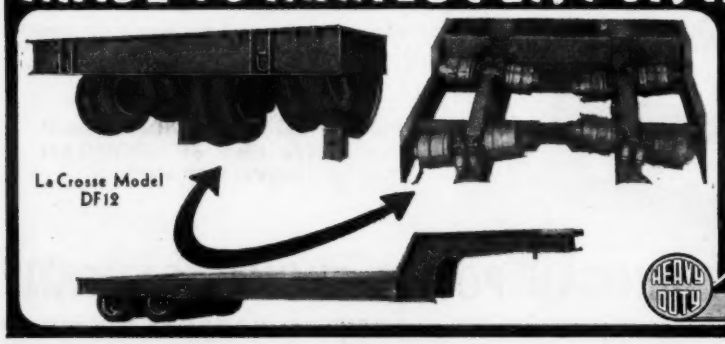
SEALTEX curing concreted Flood Control Project
CORPS OF ENGINEERS



SEALTEX meets the exacting specifications of the Bureau of Reclamation, Army and Navy, other Federal agencies; State Highway Departments, Counties, Cities; Engineers and Architects.

CLEAR • WHITE—PIGMENTED • GRAY—PIGMENTED • BLACK

MADE TO MANEUVER FOR HEAVY HAULING



The La Crosse Model DF12 - 16 wheels - with capacities from 40 to 67 tons - is designed to provide the same maneuverability and flexibility as the medium sized La Crosse Trailer models.

Dealers in 48 States

HEAVY DUTY LA CROSSE TRAILER CORPORATION LA CROSSE, WISCONSIN

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is located between pages 16, 17 and 92, 93 to request literature available to our readers without charge or obligation.

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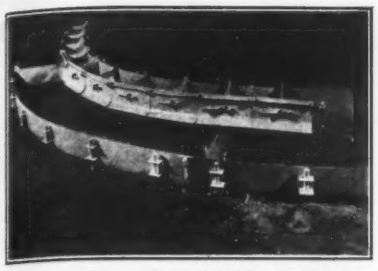


The new Blaw-Knox flexible steel face form for curb-and-gutter construction consists of straight rigid sections a foot long assembled on a steel cable, to meet the particular length or radius of curve desired.

Flexible Face Forms For Curb and Gutter

A new type of articulated flexible steel face form for curb-and-gutter construction has been announced by the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh 22, Pa. It is designed to simplify the work of forming a battered curb face, and is made to accommodate a radius of any reasonable size.

The forms consist of straight rigid sections a foot long. These sections are assembled on a steel cable in any quantity to meet the particular length or radius of curve. The cable passes through eyelets welded to the sections at both ends. Attached to one end of the cable is an I-bolt which ties to the outside eyelet of one of the end sections, while the other end of the cable is anchored to the opposite end section with a cable clamp.

For the back of the curb and for the face of the gutter, standard flexible steel forms are set and used in the usual manner. Each section of the articulated flexible face form is keyed to a dividing plate, after which the slack in the cable is taken up. If necessary, the dividing plates are then given a final adjustment. As the sections are straight and rigid, this setting results in a series of short chords. The chord marks are eliminated by hand, and the face of the curb is finished to form a true arc.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 22.

Hand Cutting Tool

A line of hand tools for cutting metal is manufactured by H. K. Porter, Inc., Somerville, Mass. It includes models designed to cut bolts, rods, wire, cable, chain, bars, and metal of all kinds. A feature of these cutters is that the cutting jaws are marked to show their capacity and the type of metal which they will cut safely.

Other features claimed by the manufacturer include a spring control to keep material from wedging under the straps, the absence of protruding screws or bolts to catch while positioning for a cut, increased strength in sections and handles, curved handles to decrease arm spread and wrist bend and to increase pull, new longer-wearing buffers, and improved hand grip.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 36.

Solvay Personnel Changes

Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y., has announced several changes in its branch-office organization.

Woodward Allen has been appointed Manager of the branch office at Charlotte, N. C., which covers the southeastern territory; he succeeds the late Harral O. Pierce. Mr. Allen formerly was Manager of the Boston office, where he is succeeded by M. S. Johnson. The Boston office serves the New England territory. H. G. Phillipps, Jr., formerly a salesman in the Cincinnati territory, has been appointed to succeed the late Brice S. Hull as Manager of the Pittsburgh branch office.

H. W. Causey has been named Assistant Manager of the Charlotte office, and M. F. Kennedy has been appointed Assistant Manager at Pittsburgh. H. R. Stoothoff was named Assistant Manager of the Chicago branch, and W. H. Floyd has been named Assistant Manager at Cincinnati.

Data on Wire-Rope Slings

A catalog on its flat-laced wire-rope slings is being distributed by the A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis 12, Mo. The Hercules Red-Strand sling is made of six parts of wire rope laced together to form a flat, strong, and flexible lifting device.

Feature of the catalog is a description of the cross-sectional area of the sling at various points, showing how its construction serves to cut down shearing and wear. It describes the details of design, lists the advantages obtained, and mentions a few of the applications for which the slings are recommended.

Engineering tables in Bulletin No. FLS-48 include information on the factors of safety, dimensions and weights, and standard fittings for the Hercules flat-laced slings. Dimensions and weights are also given for loop thimbles, choker hooks, body thimbles, and equalizing thimbles which the Leschen Co. is equipped to supply.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 70.

Air Curtain Guide Plates

For Perfect Traffic Lines:

AIR CURTAINS, basic feature of all Kelly-Creswell Equipment, make possible the application of clean-cut, attractive lines *without* coming in contact with the surface.

Special striping guns by DeVilbiss, air-actuated traction and pressure-cleaning equipment also feature K-C equipment. These are the reasons why more Highway Zone-marking material is applied through K-C equipment than through any other make.

TRUCK-MOUNTED AND PORTABLE EQUIPMENT AVAILABLE.

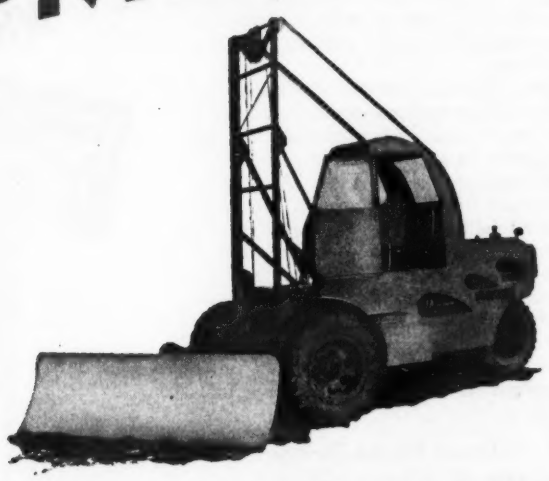
There is a Kelly-Creswell Model that will solve your zone-marking problems.

KELLY-CRESWELL CO., Xenia, Ohio

NEW REVERSING REDUCTION GEAR BOX

STANDARD ON 1948 MODELS

SCOOPMOBILE



New Improved Gear Ratios

Engineering research has improved SCOOPMOBILE performance. Incorporation of the new Reversing, Reduction Gear Box into SCOOPMOBILE'S rugged power train provides additional gear reductions of 3.01 to 1 forward, and 2.5 to 1 reverse.

The Gear Box unit, using a steel fabricated case with case hardened, precision gears is constructed to stand up under continuous heavy-duty operation. Weight of the unit is 150 lbs.

Two factors provide increased flexibility:

1. Speeds can be reduced to less than 1 MPH. for loading purposes.
2. Four speeds of motor transmission are available in both forward and reverse.

Speeds are pre-selected and quickly changed for loading or high speed operation. A neutral position is provided to disengage the Gear Box as well as the transmission when the machine is being moved between jobs. Because a SCOOPMOBILE'S load is carried in a scoop situated directly over the drive wheels, a downward pressure insures positive traction under the most adverse conditions.

Gear Box is standard equipment for all SCOOPMOBILES on order as of December 15, 1947. The unit is available for installation on existing Model B machines.

Means

BETTER, EASIER LOADING

The slow forward speed — less than 100 feet per minute . . . permits synchronizing rate of forward travel with the closing action of the bucket. Aids getting a full load.

Means

4 OPERATING SPEEDS

— Both Directions

Desired speed can be pre-selected in the motor transmission, and direction of travel is then obtained by simply moving the gear box shifting lever forward or backward.

Means

OPERATORS TRAINED

—Quicker

Inexperienced operators can handle capacity loads after the first few trial runs. Operators can select the speed at which they are most capable of handling the machine.

There is a Scoopmobile Dealer near you. Write for complete information.

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Continual Plowing Keeps Highways Open

"Big Snow" on Long Island Removed From State Roads By Town Forces; 18 Hours Brings 30-Inch Fall

✦ THE record 25.8-inch snow that fell on New York City the day after Christmas was even greater in total depth on Long Island, just east of the metropolis. Parts of District 10 of the New York State Department of Public Works, which includes Nassau and Suffolk Counties on Long Island, were blanketed under as much as 30 inches of snow. These two counties, which have a total area of 1,507 square miles and a population of 604,103 according to the 1940 census, are served by 415 miles of state highways. Over a third of this mileage has 3 and 4-lane pavements.

Snow-fighting forces of the 13 townships which comprise the two Long Island counties kept traffic moving over the state roads during and after the big snow. Continual plowing was the simple unspectacular method of keeping the highways open. By having enough plow-equipped trucks running constantly up and down these main arteries of transportation, the towns kept at least a single lane clear over most of the roads even during the worst phases of the storm.

This single lane was widened bit by bit in the days following the now historic December 26th snowfall, until finally most of the paved surface was cleared. But the weather failed to cooperate at all with the snow-weary town forces battling the heavy white blanket. The usual January thaw failed to materialize to help melt the snow away. Temperatures remained around the freezing mark or below, so that the snow turned into ice with an iron-like hardness.

Three weeks after the record fall, and with the pavements pretty well bare, the snow plows were clearing off the shoulders in anticipation of more snow. The move was a wise one. At 8:30 on Saturday night, January 17, the snow started falling again, but this time the average depth was only 6 inches. Enough snow, of course, to get the plows out, but nothing like the storm that was still so fresh in the minds of the tired crews which manned the plows. It merely meant that a much deserved rest was still a few more days away.

Towns Do the Plowing

In 1946 the New York State Legislature wrote into the law books that while the State Department of Public Works should exercise control over the removal of snow and ice from state highways, the 62 counties in the state should have the option to do this work if they so desired. In return the counties would be reimbursed by the State for the actual cost of the snow and ice removal. District 10 of the Department of Public Works on Long Island has its two counties of Nassau and Suffolk subdivided into 3 and 10 townships respectively. These townships are well represented by smooth-working highway departments which, in the past, have handled snow removal from the state highways.

Thus while the majority of the counties, including Nassau and Suffolk, have agreed to plow the state roads, the two Long Island counties have, in turn, made agreements with the towns and villages within the counties to do this work with their own highway departments. In Nassau, the County clears its own county roads, while the three townships of Oyster Bay, Hempstead, and North Hempstead remove snow and ice from the state and town roads. In Suffolk, the County engages the 10 townships to plow the county as well as the state and town roads. Suffolk County augments this snow removal and ice control with its own men and equipment. All the townships employ their own forces and equipment, and hire additional men and machines when necessary, as at the time of this last big snow fight.

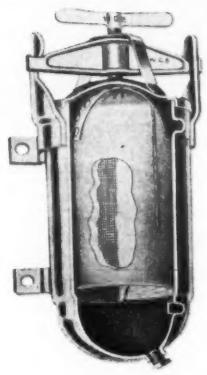
The State also provides help in the form of 30 trucks, and crews from its maintenance forces to man them. This fleet of 26 state-owned and 4 rented vehicles was used this past winter chiefly for applying sand or salt to the highways after they were plowed of snow by the town forces. This ice-control part of the winter maintenance

(Continued on next page)

For all Kinds of Oil and Motors **WGB** Clarification is Economy

MR. FLEET OPERATOR: When you received your Autocar, Brockway, Buda, Diamond T, General Motors or Mack Motor equipped with a WGB Clarofier, you obtained the best filtration that money can buy—provided you use genuine WGB cartridges, which are covered by patents preventing duplication. But if you use substitutes, which are prevented from using the WGB principle, you cannot expect WGB economy or motor protection.

Descriptive literature sent on request



The results which have induced manufacturers to equip their fine motors with WGB Oil Clarofiers were obtained by use of the complete unit. It is not WGB filtration unless genuine WGB cartridges are used. Substitutes cost more because they do less. Be fair to yourself, to your motor and to the WGB Clarofier. Use genuine WGB cartridges and you'll get the economy, efficiency and motor protection which the manufacturer intended you to have.

W. G. B. Oil Clarifier, Inc. 139 Cornell St. Kingston, N. Y.

THE HARD WAY!
Expensive, clumsy equipment . . .
Three or four separate operations.
THE TEMPOTOOL WAY!
One small easy-to-handle tool . . .
self-contained . . .
Fastening time: one second flat!

WHICH METHOD WOULD YOU CHOOSE FOR THIS FASTENING JOB?

FOR HEAVY FASTENING
Pats. Pending
FOR LIGHT FASTENING
WILL PENETRATE MILD STEEL UP TO ¾" THICK.
WILL PENETRATE MILD STEEL UP TO ⅛" THICK.
TEMPOTOOL "22"
TEMPOTOOL "38"

When you compare the ease and simplicity of fastening the TEMPOTOOL way with old-fashioned methods, it's small wonder that TEMPOTOOL has met with immediate and enthusiastic acceptance from coast to coast.

From every standpoint—cost, speed and performance—the TEMPOTOOL principle of fastening is by far the most efficient yet developed. Reports from users show time and material savings up to 50%.

TEMPOTOOL is a relatively small, self-contained tool which carries its own power in the form of a powder load. No outside power source is required and cables, air lines, compressors, and other expensive equipment is entirely eliminated.

Both TEMPOTOOL models are completely "safety engineered" to prevent accidental discharge. A wide range of straight and threaded stud sizes and three different powder loads are available for each model.

Chances are you can use TEMPOTOOL somewhere in your business.

Get the whole story today.
Send for this new folder.

TEMPO PRODUCTS COMPANY
1900 Euclid Ave. Cleveland 15, Ohio Dept. 314

THE TEMPOTOOL PRINCIPLE OF OPERATION

TEMPOTOOL employs the power of an exploding powder charge to drive a "holding stud" into steel, concrete or masonry.

The high velocity of the stud is such that it imbeds itself firmly in steel, concrete or other relatively tough materials. It will withstand many hundreds of pounds of direct pull and is highly resistant to vibration. The holding principle of the stud is similar to that of a nail—increased a thousandfold.

Three powder loads for TEMPOTOOL are available for "controlled power" on the job.

TYPICAL TEMPOTOOL STUDS
TREATED FOR RUST RESISTANCE

"22" STUDS

For direct fastening of steel up to ⅛" thick to concrete or masonry.

Short Shank for direct attachment of light metal objects to hard concrete or mild steel up to ⅜" thick.

Standard ¼" x 20 NC for use in mild steel, concrete or mortar joints. Objects can be attached to it with standard nut.

Same as above but with short shank. For use with very hard concrete and mild steel up to ⅜" thick.

"38" STUDS

For attachment of metal objects up to ⅛" thick direct to concrete or masonry. Available also with 1¾" shank.

Threaded stud for use in concrete, masonry or steel. Used as an anchor to which objects are attached with a standard nut. Available in ⅜", ½" and ⅝" std. threads.

Standard ¼" and ⅜" internal threaded studs. Can be fired directly into steel, concrete and masonry.

TEMPOTOOL
TRADE MARK REG. U. S. PAT. OFF.
THE NEW Powder-Actuated HAND TOOL

Four days after the "Big Snow"—traffic moves on State Route 27, 2 miles west of Patchogue in Suffolk County, Long Island. Town forces in District 10 kept most highways open, even during the worst of the storm, by continual plowing.

is handled about 50-50 by the State and townships. The latter are given their choice of the portions of highways that they can maintain with regard to ice, while the State looks after the remainder. Some townships do nearly all the sanding and salting themselves, while others turn over a great deal of that work to the State.

Weather Forecasting

Preparedness and forewarning, it almost goes without saying, are prime factors in any successful snow-removal plan when combined with adequate equipment and experienced personnel. To insure a prompt notification of impending storms with all the essential details of their nature, the State has contracted with the Northeast Weather Service with headquarters at Boston, Mass., to send a storm report to the District 10 headquarters at Babylon on the south shore of Long Island. This is not a weather report, but a warning of storms likely to bring snow into the area, or rain which might freeze and thus create a hazard on the highways. It is a winter service only, to help in the control of snow and ice.

The service is on a 24-hour basis. The reports are sent to the Babylon office which relays them by telephone to the county and town highway superintendents. In Suffolk County, where there are 10 different townships, the directives from and reports to the State Department of Public Works are coordinated by Bob Newcomb of the County Highway Department. Besides the general supervision exercised by Edward Dayton over the work, the State also has its two Maintenance Engineers, Edward Conroy in Suffolk and Harry Davis in Nassau, to keep close check on the snow and ice control.

The storm warnings are telephoned from Boston to Mr. Dayton at the Babylon office during working hours, or to his home if it is at a time when the office is not open. Telegrams are used if the telephone call cannot be put through. The messages usually are received from 12 to 24 hours in advance of the storm, and contain the following information:

Type of storm—snow, sleet, freezing rain, etc.; if it is snow, whether it is the wet or dry kind, and the temperature to expect with the precipitation; the accumulation expected, in inches; the probable time when enough snow will have fallen (normally 1 to 3 inches) to warrant sending out snow plows; the expected duration of the storm; probable wind conditions; together with the weather forecast for 24 hours after the storm. If the storm is rain, the forecast will indicate whether or not to expect it to produce ice, and when the roads may be in need of sand or salt.

The Big Snow

Warning had been received well in advance of the big snow of December 26. And the forecast was accurate as to the time, 3 a.m., when the snowflakes would start falling. But the report went awry on the expected amount of precipitation; this was given as 15 inches maximum over an 18-hour period. The snow fell steadily until 5 p.m. After that it fell lightly 4 more hours with strong north winds, until it stopped at 9 p. m.

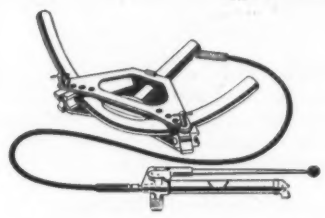
During those 18 hours the western part of Nassau County received 25.8 inches of snow, the same amount as was recorded in New York City. Reports from the central part of Long Island revealed that from 26.5 to 30 inches of snow had fallen. At the eastern end of the Island beyond Riverhead and Hampton Bays in Suffolk County, the amount of snow that fell was considerably lighter. This is characteristic of the fish-tail tip of Long Island where the great expanse of the surrounding salt waters of the bays, the Sound, and the Atlantic have a moderating effect on snow storms.

At 5 a.m., two hours after the first flakes had floated down out of the dark winter sky, 2 inches of snow had fallen. This was enough for the fleet of snow plows, which had previously been alerted, to swing into action. If the forecast had indicated that snow would not be plowable until after the men would ordinarily report for work in the morning, they would not have been called out beforehand. On this occasion, however, the warning of a heavy snow starting in the early morning hours was sufficient to call out the plows and crews well in advance of the usual time.

Besides getting the town and county forces into the snow fight, the engineers had consulted their big map of the District which shows the great network of roads crisscrossing Long Island. Around the outside of the map are boxes enclosing the name, address, and telephone number of the foreman of each maintenance crew; the number of men in each gang; what special equipment they have, such as sander, salter, etc.; and also corresponding data on the equipment operator in case the foreman cannot be reached. Members of each crew live in the same locality so that it is easy for the foreman or driver to round them up. The truck is also kept near the home of the operator instead of at the central garage in Babylon, so that no time is lost in getting it into action as speedily as possible.

Of the 30 state-owned or operated trucks used for ice control, only one is equipped with a snow plow, and that is used wherever needed to augment town equipment in emergencies. The towns do the plowing, while the state trucks stick to sanding or salting. The crews also dig out drainage basins, and open up channels so that when the snow melts it can run off the road into the ditches. These maintenance trucks are

(Continued on next page)



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BENDER

...check to make sure you get these features:

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☑ Lightweight, portable—one man can easily take a Blackhawk Pipe Bender right to the job. Bends rigid conduit and pipe in all popular sizes, up to 4" diameter.

WORKS AT ALL ANGLES

☑ The compact hydraulic Porto-Power Ram is all-directional. Power eliminates need for heating the pipe.

WORK OVERHEAD

☑ All-directional operation and light weight enlarges range of utility to use on ladders, scaffolds and cramped quarters and work on existing pipe runs.

SIGHT FROM ANY ANGLE

☑ Remote control permits operator to stand in any position for a full view of the job. Saves need for elbows, couplings, cutting and extra threading.

DETACHABLE POWER UNIT FOR EXTRA UTILITY

☑ It pulls gears, lifts machinery, and licks scores of other trouble jobs.

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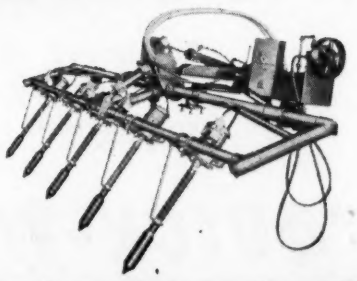

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ORIGINATORS OF INTERNAL CONCRETE VIBRATION

724 S. Flower Street, Burbank, California

Continual Plowing Keeps Highways Open

(Continued from preceding page)

equipped with tow ropes to help the traveling public—to pull cars out of drifts and back on to the highway if they have gone off, or to help them if they have broken down.

Constant Plowing

About 100 pieces of equipment in all were used on state highways during the storm. Most of these were trucks with blade plows. There were also some Walter Snow Fighters with V-plows, some motor graders, and several Snogos.

By keeping the trucks running constantly day and night, at least one lane was opened for traffic on practically all the state highways during and after the big snow.

The greatest obstacle the plows encountered in clearing the roads was the great number of cars and trucks abandoned by their drivers. Many old cars became inoperable when their clutches burned out from straining in a deep drift. Even new cars, equipped with chains, found the going too tough when forced off the pavement through bad visibility. These vehicles were left haphazardly across the pavement and soon became covered with snow. As a result the plows were forced to decrease their speed in order to avoid ramming into these abandoned machines. The slower speeds cut down considerably the effectiveness of the plows, and the opened lane became a series of curves as the trucks swung in and out around the stalled cars.

One of the bad spots that developed during the course of the plowing was on the Montauk Highway near Oakdale where a monster trailer-truck jackknifed across the road, and then could not get out of the drifts. Neither could the heavily laden transport be towed out of the way. Traffic threaded a tortuous way around the big vehicle for two days until it was finally dug out of the snow. In some places drivers did not return for their cars until three days after the storm. As a result, clearing that part of the road was delayed and the rest of the job was held up. When anything interfered with the continual movement of the plow-trucks, the progress in snow removal suffered accordingly.

Despite the wet snow which made visibility extremely poor, the roads were kept open in all but a few isolated locations. Except for the hilly north shore, the topography of Long Island is uniformly flat. As a result the edges of the road became difficult to define under the deep, white blanket, and the plows at times wandered off the pavement. Possibly the greatest shortcoming in the plowing was failure to get the blades down deep enough to scrape the pavement in the early passes. Consequently although a lane might be opened, traffic was traveling on several inches of snow. Eventually this snow base became rutted, offering another hazard to driving, and had to be replowed.

During the storm and the days and nights following it, the telephone in the Babylon District office was never unattended. Complaints were received and passed on to the town which had jurisdiction over that particular stretch of road, or else they were handled by the state maintenance crews—particularly if the call referred to an icy condition on the highway.

Ice Control

As the plowing progressed, the roads were salted or sanded by either the state or town forces. This is also done after a very light fall of snow in order to prevent a slippery condition on the highways. When sand is used, salt is always added to the stockpiles at the rate of one bag of salt per cubic yard of sand to keep the aggregate from freezing. It also speeds the loading from the piles to the trucks. In the past, this loading was done mainly by hand, but is now done with bucket conveyors or small shovels.

Up until fairly recently, calcium chloride was the principal material spread on the roads to melt the ice. But as this became more difficult to obtain, sodium chloride or rock salt was used instead. The salt is distributed down the center of the road at an average rate of five bags of salt per mile. This forms a brine that runs off the pavement, carrying with it the now melted ice and snow. The state maintenance trucks apply the salt with Tarco

(Concluded on next page)

"Of course I'm nuts about it—what real he-man would like to be stooping over a drafting table in a stuffy office when he can be out like this!"

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BUILD BIGGER PROFITS
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Low initial investment, low maintenance. Many equally efficient attachments for one operating unit—on one chassis.
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All parts of clutches, brake bands, hydraulic cylinders in clutches and control cabinet and many bearings are interchangeable.
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Fast hoist and swing action mean more material moved per man hour—more profit on every job.
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Convertible in MINUTES from shovel to dragline, clamshell, crane, trench-hoe, pile driver, scoop, or backfiller.

Any man who owns one or more **"QUICK-WAY"** will tell you they're big money-makers. Ask him why and he'll give you many good reasons. Watch a **"QUICK-WAY"** operate and you'll see for yourself that he's 100% right.

Regardless of what equipment you own, you need **"QUICK-WAYS"** too. Theres a **"QUICK-WAY"** owner near you: ask HIM.

Model E: 4/10 cu. yd. cap. for mounting on any standard 5-ton truck.
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Service available from our Distributors, strategically located throughout U. S. and worldwide.

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For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

"QUICK-WAY" TRUCK SHOVEL CO.
DENVER, COLORADO

PIONEER IN POWER SHOVELS FOR TRUCK MOUNTING; STILL THE LEADER AFTER 29 YEARS

Scotchman salt spreaders which are hooked on to the rear of the trucks and hang from the tail-gate. An average speed of 20 mph can be maintained by the salt-spreading trucks.

In applying the sand, Good Roads sand spreaders running on two wheels are fastened to the rear of the maintenance trucks which move down the center of the highway. A revolving disk throws the sand far out to the sides of the road, effectively covering the slippery ice or snow with an anti-skid surface. The trucks are re-loaded from conveniently located roadside stockpiles.

Three-Year Contract

In some locations where the snow's presence constituted a traffic hazard, it was loaded into trucks and carted away. This was done not only in towns and villages to make room for parking, but also on some important highways as at busy intersections. Where the state highway goes through some villages, the towns often sublet the snow removal to village authorities, so the state work may be done by either county, town, or village.

In any event, a daily report is submitted to the State District office giving the equipment that was used by any of the lesser local governmental agencies, together with their payroll. A standard rate for equipment rental prevails throughout the entire state. The towns rent additional equipment such as trucks, plows, cranes, etc., to augment their own machines in a snow as big as the record fall on December 26.

The contract that the State makes with the respective counties for snow removal on state highways runs for three years, and is renewable each year. In this way the State is protected if a county should want to drop the plan, by having three years in which to make other arrangements for snow removal in that county. Also, the counties and towns can purchase new equipment with assurance of three years' work ahead. Contracts have been negotiated with nearly all of the 62 counties in New York, and so far the counties seem satisfied with them.

J. J. Darcy is District Engineer of District 10 with headquarters at Babylon. Charles H. Sells is Superintendent of the Department of Public Works.

Metal-Spraying Equipment

Two new pieces of literature are now ready for distribution by the Metallizing Engineering Co., Inc., 38-14 Thirtieth St., Long Island City 1, N. Y. Bulletin No. 57 deals with Metco Sprabond, a metal which the manufacturer says can be sprayed directly onto smooth, polished steel, and other metals, without any preliminary surface preparation. Bulletin No. 55 deals with the new light-duty low-air Type L metallizing gun, which operates on 10 cubic feet of air a minute.

Bulletin 57 describes the three steps involved in building up a worn object through metallizing with Sprabond. It lists the applications and the advantages claimed for the product. Bulletin 55 details the construction of the Type L gun which permits its use with a low air supply. It shows several photographs of the gun in use, as well as one of a typical set-up of the equipment used with the gun.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 63.

Chain Belt NYC Sales Mgr.

Fred C. Wilcox has been named New York Manager of Sales for Moto-Mixers and Moto-Agitators by the Chain Belt Co. of Milwaukee, Wis. Mr. Wilcox has served metropolitan New York and northern New Jersey since 1928, as a specialist in the field of plant equipment for ready-mixed concrete.

Tractor Steering Aid

A steering aid for use with crawler tractors is made by the Silver Booster Mfg. Co., 1406 So. Grand Ave., Los Angeles 15, Calif. Several models are available to fit most clutch-type steering tractors. The boosters are said to reduce the required pull on clutch steering levers from approximately 125 pounds to less than 15 pounds.

They can be installed without major adjustments or alterations to the tractor, the company points out. Their over-center action is said to increase the efficiency of the steering clutches, to reduce wear on the throwout bearings, and to increase brake life.

Production facilities for the Silver Booster steering aid will move April 1 to a new plant at 812 So. Flower St. in Burbank, Calif. The company will combine facilities with the F. A. Straub Equipment Co., which makes parts for the boosters.

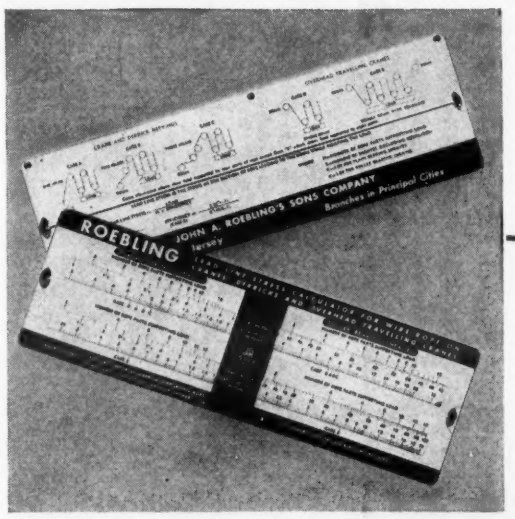
Further information on these steering aids may be obtained from the company, or by using the enclosed Request Card. Circle No. 50.

Contractors' Tools Data

Specification sheets describing its line of tools for use by contractors are being distributed by Brunner & Lay, Inc., 727 So. Jefferson St., Chicago 7, Ill. These sheets illustrate each of the items, and a tabulated list gives the sizes in which each is made.

The tools which Brunner & Lay supplies include: moil points, narrow chisel bits, 3-inch chisel bits, asphalt cutters, brick-removing tools, frost or digging chisels, frost wedges, dirt tampers, sheathing drivers, concrete busters, broaching tools, bushing tools, tooth chisels for trimming concrete, clay spades for breakers, clay spades for clay diggers, clay picks, tie tampers, moil points for clay diggers, solid drill steels, conventional-type hollow drill steels, pneumatic star drills and wrenches, and hollow conventional-type drills with turned body.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 55.



YEAR BY YEAR, planes grow bigger . . . faster and safer. Man has unbounded confidence in his ability to build better and better planes. Never satisfied, he experiments and tests tirelessly, and aviation progresses.

With similar vision and confidence, Roebling has been pacemaker in the development and manufacture of products essential to the transportation and other industries. The active, widespread confidence it has won among technical men and operators throughout industry is Roebling's proudest asset. Look to Roebling for continued leadership . . . continual improvement in its products and engineering . . . continual progress.

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DATA used by Roebling engineers themselves are embodied in this unique "slide rule". It's the Roebling Lead Line Stress Calculator for wire rope . . . tells you in a moment the safe and economical size of rope for every load . . . gives the right answer for all types of crane, derrick, and overhead traveling crane installations.

Here's information you can accept and act upon with complete confidence . . . just as you can specify Roebling "Blue Center" Steel Wire Rope for unsurpassed toughness, dependable reserve strength and the reduction of costly replacement shut-downs. Roebling was America's first wire rope maker, and "Blue Center" Steel Wire Rope is the finest that Roebling knows how to make.

Write for a Roebling Lead Line Stress Calculator — it's free. And let your Roebling Field Man tell you about installation and maintenance practices that prolong wire rope life. Call him at your nearest Roebling branch office.

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The truck driver controls The Shoveller Corp. Truck-Loader without leaving his cab and without assistance. He backs his truck onto the loader pads, engaging truck hitch and loader, and then can raise the bucket or lower it by moving forward or backing up on the pads.

Truck-Loading Unit Is Driver-Operated

A stockpile truck-loading device which features one-man operation has been developed by The Shoveller Corp., 36 Warren Ave., Portland 5, Maine. The truck driver controls the loading process without leaving his cab, and without assistance, the company explains. The only equipment needed on the truck is a special hitch. The loader can be used with any number of trucks equipped with this hitch. No power take-off is required.

The manner of operation is this. The loader is laid flat on the ground. An empty truck then backs onto the loader pads and engages the hitch and loader. Special deflector plates are designed to guide the hitch into the loader, and the hitch is engaged by means of a control in the cab. The truck can then push the bucket into the pile of material to be loaded.

After the bucket is loaded, the truck moves forward on the pads. Traction of the truck's rear wheels on the pads operates a lever mechanism which raises the bucket to the loading position. As it reaches its top position, it dumps the material into the truck. To lower the bucket, the driver backs up the truck. The unit is released from the hitch, and the truck can drive off. The loader is then ready for use with another truck. Two sizes of buckets are available—¼ or ¾-cubic-yard.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 34.

Electric-Generator Data

A bulletin on the features and uses of its packaged generators is being distributed by the Electric Machinery Mfg. Co., 821 Second Ave. S. E., Minneapolis 14, Minn. This 16-page issue of "Synchronizer", Vol. 8, No. 3A, features seven tables of data to guide users of this type of equipment. The tables cover such problems as selecting the type of electric service required; determining power requirements for induction motors; computing wire sizes; and determining sizes of conductors and conduits for the various-size generators.

"Synchronizer" is the house organ of the Electric Machinery Mfg. Co., and this issue also contains articles on the new Regulectric generator, a description of the Regulectric circuit, and a feature article on pre-engineered generator switchgear.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 58.

Sales Mgr. for Duff-Norton

L. E. Lee is the new Sales Manager for the Duff-Norton Mfg. Co., Pittsburgh, Pa. .Mr. Lee was formerly associated with the Goodyear Tire & Rubber Co., and the Johns-Manville Sales Corp.

ASCE 1948 Officers

Richard E. Dougherty has been elected President of the American Society of Civil Engineers for 1948. Mr. Dougherty is a Vice President of the New York Central System. Also announced was the election of two new Vice Presidents and six new Directors.

Col. Carlton S. Proctor, New York City, and John W. Cunningham, Portland, Oreg., consulting engineers, were chosen as new Vice Presidents.

Selected as new Directors are: William McK. Griffin, Deputy Chief Engineer, Triborough Bridge & Tunnel Authority, New York City; Edmund A. Prentis of Spencer, White & Prentis, New York City; Joel D. Justin of Justin & Courtney, Philadelphia; Julian Hinds, General Manager and Chief Engineer, Metropolitan Water District of Southern California, Los Angeles; Col. Webster L. Benham, of the Oklahoma City engineering firm which bears his name; and C. Glenn Cappel, of the W. Horace Williams Co., New Orleans.

Sound, Solid Construction
from the Ground Up
One look at a heavy duty GMC is all you need to see that here is a vehicle built to haul big truck loads and do real truck jobs. GMC heavy duties are sound and solid from the ground up . . . designed, engineered, and produced to provide powerful, dependable, long-lasting performance on toughest hauling assignments.
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GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION
THE TRUCK OF VALUE
GASOLINE • DIESEL
GMC TRUCKS
Help America Produce For Peace...Turn In Your Old Scrap Iron and Steel

Alignment Improved In Road Grading Job

A 4-Inch Course of Slag Laid to Maintain Traffic During Work; Gravel Base, Concrete Paving Follow

✦ THE last section of U. S. 60 between Charleston and Huntington, W. Va., that needed widening and a less-curved alignment was so improved last summer with a 5.9-mile grading contract. On this nearly 6-mile stretch of main highway there were formerly 53 curves with a maximum curvature of 20 degrees. The new alignment, practically all on new location, straightens out the road so that it now has only six curves, the sharpest of which is 5 degrees 20 minutes. Grades were also reduced so that the maximum is now 3 per cent. The project is on an interstate system and the design is in accordance with specifications for such highways.

The improved section is in Putnam County near Hurricane, 25 miles west of Charleston. Two contractors, the Smith Construction Co. and the Price Construction Co., both of Huntington, W. Va., were awarded the grading and drainage job on their joint low bid of $630,141 to the State Road Commission of West Virginia. The project took a year to complete, running from July, 1946, to July, 1947. Heavy rains with accompanying flash floods in the first half of 1947 delayed the work considerably.

New and Old

Built 25 years ago, this section of the original highway had an 18-foot bituminous-macadam pavement. On both ends of this old stretch of road, U. S. 60 has been reconstructed into a 2-lane concrete highway with a divisor strip down the center to separate opposing streams of traffic. For the present reconstruction, additional right-of-way was acquired from 80 feet to a maximum of 300 feet wide through the hilly region.

The new roadway is 61 feet 6 inches wide and is topped with a 4-inch compacted course of gravel extending out to the shoulders. The gravel will serve as a foundation base for the reinforced-concrete paving which will be 8 inches uniform depth. A contract for the paving has been awarded to W. H. Ringwald & Sons Co. of Chillicothe, Ohio, on its low bid of $489,860. Paving began August 28, 1947. Before winter closed the job down, about 4½ miles of 2-lane pavement had been completed. For the present the pavement will consist of two 12-foot lanes separated by a 4-foot median strip of dark concrete set flush with the adjoining pavements. Eventually a second 12-foot lane will be added alongside each present opposing strip. Air-entraining cement is to be used for the concrete pavement.

A good part of the new alignment entailed sidehill earth work. While the deepest cut and highest fill along the center line was not over 20 feet, grading had to be done 70 feet high in some locations on slopes 200 feet out from

(Continued on next page)

C. & E. M. Photo

An Adams motor grader blades some rough sections from a cut on the improved section of U. S. 60 in West Virginia. Two-way traffic had to be kept rolling on the existing road during all construction operations.

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STRONG—this rugged lubricator can take it, actually stronger than cast iron.

FOUR MODELS—Sizes from 1/6 pt. to 1 pt. capacity. Pipe size to one inch.

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Order from your dealer
If he cannot supply you, write direct, sending us your dealer's name.

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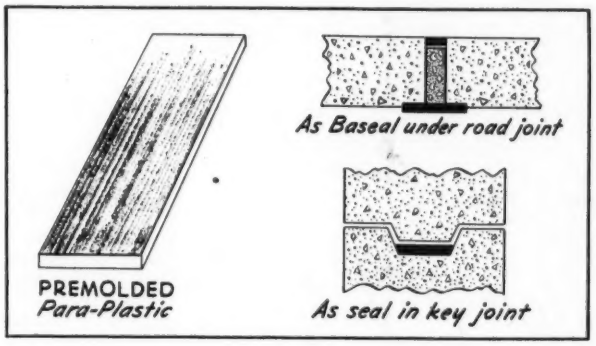
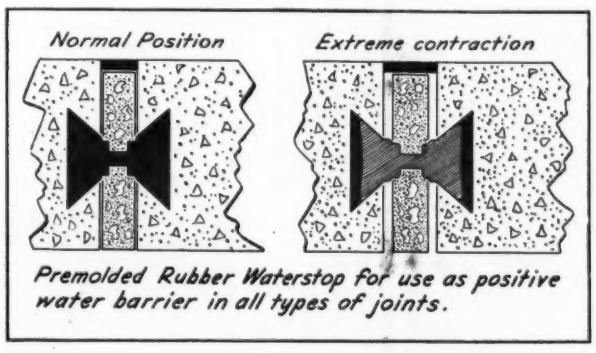
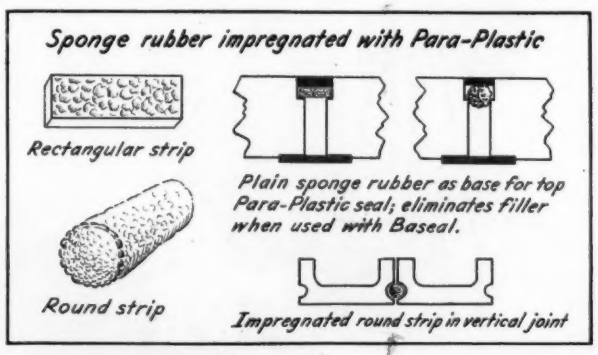
BETTER JOINT PROTECTION

as developed by Servicised

WITH PARA-PLASTIC AND COMPANION PRODUCTS




Normal Position
Extreme contraction
Premolded Rubber Waterstop for use as positive water barrier in all types of joints.


Sponge rubber impregnated with Para-Plastic
Rectangular strip
Plain sponge rubber as base for top Para-Plastic seal; eliminates filler when used with Baseal.
Round strip
Impregnated round strip in vertical joint

Premolded PARA-PLASTIC Strips solve a definite need where a positive water seal is required in construction joints but where it is not practical to hot pour the material. The illustrations show how a ½" x 10" strip may be placed on the sub-soil directly under the road expansion joint, and how a ½" x 6" strip can be placed in a key construction joint as a positive seal where the joint is below water level.

The extruded rubber water stop was designed to replace the "metal dam" type of water stop. It has the definite advantage of being able to move with the concrete in contraction without losing seal. It will not crystallize or break in the joint. This water stop is recommended where seal against considerable water pressure is required, or wherever a dam is indicated in addition to the sealing material.

The offset joint as shown in illustration permits the use of a sponge rubber rectangular or round strip to be used as the retaining base for the top PARA-PLASTIC seal. Combined with Premolded Baseal Strip at the bottom of the joint, it provides a good joint without the use of a filler. The round strip in the lower sketch is impregnated with PARA-PLASTIC and serves as an excellent seal for vertical joints. The sponge rubber prevents cold flow of the seal.

PARA-PLASTIC IS AVAILABLE IN BLACK AND COLORS.
All colors fully meet Federal Specification SS-F-336.

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6051 West 65th Street, Chicago 38, Ill.

Alignment Improved In Road Grading Job

(Continued from preceding page)

the center line. Earth fills were placed in 8-inch lifts on 2 to 1 slopes. Where rock was used in the fills, 2-foot layers were permitted, and the slopes were 1½ to 1. Rock fills were specified wherever a mountain creek, which meanders along the right-of-way, touches directly onto the fills. The voids between the larger chunks of rock were filled with spalls and fines, to prevent erosion which would be almost bound to occur if earth fills alone were constructed. Rock was also dumped for about a mile over the old creek bed where a stream change had been made. On these rock fills the upper 3 feet was built of dirt.

In cuts up to 3 feet, 4 to 1 slopes were the rule in earth sections. This line was gradually sharpened as the cuts grew deeper, and everything over 12 feet deep had 1½ to 1 slopes. In sandstone and shale the slopes are 1 to 1, while in rock they are ¾ to 1. Backslopes are 1 to 1 or 3 to 1, according to the depth of the cut, running up from the V-type ditches. In several of the clay cuts, slides caused trouble both during the construction and even after the slope lines had been established. The ground which was water-soaked from the heavy rains was the contributing factor in these earth movements.

Drainage

All the cut sections have subgrade underdrain consisting of 8-inch perforated concrete pipe placed 2 feet beyond the edge of the ultimate concrete lane. A Barber-Greene trencher made a 22-inch-wide cut to an average depth of 32 inches; in this 4 inches of gravel was placed. The pipe was laid on the gravel and more gravel was placed as backfill to within 10 inches of the top. The rest of the trench was backfilled with clay.

Over 22,000 linear feet of the perforated underdrain was furnished by the Union Concrete Pipe Co. of Ceredo, W. Va., which also delivered the material to the job site. Pfaff & Smith Building Supply Co. of Charleston, W. Va., supplied the gravel. The material was taken from the Ohio River and barged up the Kanawha River from Point Pleasant to St. Albans where it was unloaded and stockpiled. From that point it was trucked an average of 12 miles to the project.

Drainage structures consist of 15 culverts ranging from 2 x 6 to 12 x 14 feet in size, together with a large 12 x 12-foot twin-box reinforced-concrete structure, 38 feet long, which carries a creek under a side-road approach to the main highway. Concrete for the structures was delivered to the various construction sites in 5-yard truck-mixers by Ross Concrete & Mortar, Inc., of Huntington, W. Va. The average haul was 22 miles, and four truck-mixers were sufficient to handle all the pours at any one time.

Rock Work

In the contract the roadway excavation was unclassified, but the rock borrow item came to the appreciable amount of 38,900 cubic yards. This material was needed, as mentioned previously, to put in the fills bordering the creek. In addition to the rock taken from the roadway excavation, two borrow pits were opened to provide the necessary material. The average haul from these pits was 5,000 and 1,000 feet respectively.

C. & E. M. Photo

A Hough Payloader was used to good purpose by contractors Smith and Price to clean up roadside borrow pits when grading on U. S. 60 was completed.

In removing the rock, blast holes were drilled on an average of 10-foot centers both ways, and to a maximum depth of 20 feet. Ingersoll-Rand equipment was used in the rock work; it consisted of two wagon drills powered by two 500-cfm air compressors, and six Jackhamers for auxiliary drilling and secondary blasting. Du Pont 40 per cent dynamite was used to charge the drill holes, and about 100 holes were shot at a time.

The bulk of the rock was dug out by a Marion 2-yard shovel assisted by a pair of 1½-yard Northwest shovels; the latter were also employed on the dirt work. Eight Koehring WD-60 Dumptors handled the heavy rock hauls, with a fleet of six GMC trucks on hand for either rock or dirt work. The two types of movers carried pay loads of 5 and 6 cubic yards respectively.

(Concluded on next page)

ROAD SIGNS AUTOMATIC TYPE

3 ft. or 4 ft. furnished complete with sign and 2 red flags. Beside the sign illustrated therewith we supply wording as follows: "Danger," "Danger Men Working," "Men Working Above." Also have other types.

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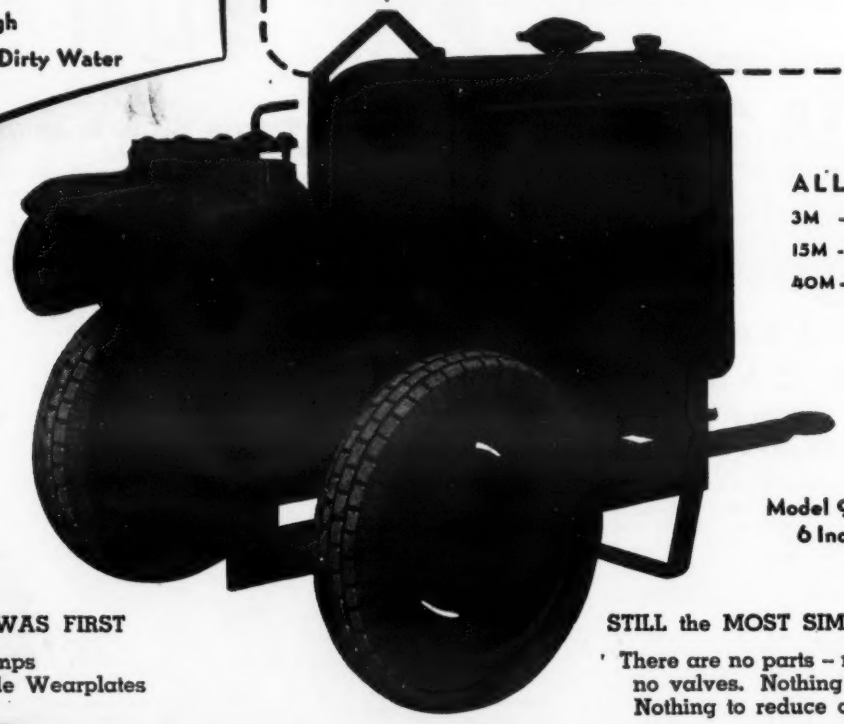
Our distributors are authorized to put a Gorman-Rupp Contractor's Pump on any pumping job, anytime, anywhere, alongside any other make pump, size for size. The Gorman-Rupp pump is guaranteed to pump more dirty water, more hours, using less gasoline, to prime quicker and at higher suction lifts than any other self-priming pump. If it isn't the best all around pump, our distributor will accept the return of the Gorman-Rupp pump and pay the user any installation expense incurred.

* Sea level. Performance data inquiries invited.



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Model 90M
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THE GORMAN-RUPP COMPANY
257 N. Bowman Street, Mansfield, Ohio

Dirt-Moving

The two contractors on this joint grading venture divided the project into two sections; the Smith Construction Co. took the west half and the Price Construction Co. worked the east half. Although the new road does not follow the alignment of the old, about half the old pavement had to be removed either where the two lines crossed each other, or where the widened roadway required it. The aged bituminous-macadam pavement was first scarified by the two Adams power graders on the job, and pushed up into piles by some of the eight International TD-18 tractor-dozers employed on the project. Two smaller shovels, Bucyrus-Erie ¾-yard models, which were also used on the drainage-structure excavation, loaded the broken-up pavement into trucks.

Besides the material excavated from the roadway, additional dirt was taken from one of the pits that had been opened up for rock borrow. The dirt was obtained from a 10-foot layer of overburden topping the rock beneath. Stripping was done either with one of the shovels or with tractor-scraper units.

The shovels and trucks were used for the long hauls averaging 1,000 feet on the roadway excavation, assisted by two Super C Tournapulls carrying 15 yards. About 60 per cent of the grading was done with this equipment. The remaining 40 per cent of the earth work was handled by three International TD-18 tractors pulling Bucyrus-Erie 15-yard scrapers, and two TD-14's pulling a Bucyrus-Erie 10-yard and a Heil 6-yard scraper. The scrapers averaged a 500-foot haul, and they were assisted in loading by the dozers. Any hard shale encountered was broken up by a LeTourneau Rooter pulled by a TD-18 tractor.

The proper compaction on the dirt fills was achieved with a LeTourneau sheepsfoot roller pulled by a TD-18. Four 10-ton 3-wheel rollers, three Buffalo-Springfield and a Huber, were also on the job. They rolled the rock fills and compacted a slag foundation course on which traffic was maintained during construction.

Slag Course

The Standard Slag Co. of Youngstown, Ohio, supplied the necessary slag for this base-course item in the grading contract. The company shipped the material by barge from Weirton, high up in the West Virginia panhandle, down the Ohio River and up the Kanawha to St. Albans, a distance of over 200 miles. Carrying 300 tons of 1-inch-down slag, the barges were unloaded by a derrick boat and a belt conveyor which stockpiled the slag on the river bank. Trucks hauled the slag to the road where it was dumped, spread by the graders, and compacted by the smooth-wheel rollers into a 4-inch base course.

During all the construction operations 2-way traffic had to be maintained on the existing road despite whatever grading chanced to be in progress. The contractor elected to use slag wherever the going got too soft for cars to move over the grade. The motor graders also worked over the route. They bladed down the rough spots to keep traffic rolling and also maintained the haul roads for the dirt-moving equipment.

After work each night a grease rig serviced each piece of equipment. During the day the units were supplied with fuel from a service truck which carried drums of either gasoline or diesel fuel to the machines. At the contractors' headquarters both types of fuel were stored in two 3,000-gallon tanks from which the service drums were loaded. The Smith Construction Co. used Pure Oil Co. products while the Price Construction Co. used Standard Oil Co. fuel.

When the grading was completed the roadside borrow pits were carefully cleaned up and smoothed over so that the scars of construction would be noticed as little as possible. A Hough Payloader was used to good purpose in these operations, removing large chunks of loose rock and piling them into trucks for disposal along the fills. Later when the paving is completed a roadside-development contract will be let for planting and landscaping the project.

Quantities and Personnel

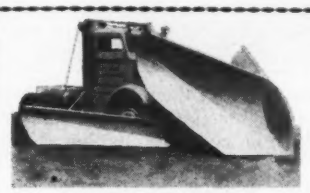
A force of 100 was employed when construction was at its peak. L. F. Bradley and Paul Price were Superintendents for the Smith and Price companies respectively, while William Kyle was Engineer for the contractors. For the State Road Commission of West Virginia, John J. Johnson was Resident Engineer, assisted by Inspectors J. H. M. Ervin and John F. Muck. M. L. O'Neale is Chief Engineer for the Commission, George W. McAlpin is State Construction Engineer, and B. D. Johnson is Regional Construction Engineer.

The major items in the contract included the following:

Unclassified excavation	448,200	cu. yds.
Borrow excavation	30,000	cu. yds.
Rock borrow	38,900	cu. yds.
Excavation for structures	12,575	cu. yds.
Concrete	3,392	cu. yds.
Reinforcing steel	176,000	lbs.
Reinforced concrete pipe, 15 to 60-inch	5,905	lin. ft.
Perforated concrete pipe, 8-inch	22,300	lin. ft.
Special rock fill	16,100	cu. yds.
Slag for base course	15,000	tons

Lima Dealer in Ohio

The Conners Equipment Co., Cleveland, Ohio, has been appointed as agent for the northeastern Ohio territory by the Lima Shovel & Crane Division of the Lima-Hamilton Corp. Offices are located at 851 Leader Bldg., in the city of Cleveland. The Conners Co. also represents the Insley Mfg. Corp. and the Owen Bucket Co.



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enjoy engineer-preference throughout the snow belt. They have won their spurs through Faster • Safer • Cleaner Snow Removal.

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The best time to think about increased efficiency for next year is NOW when the recent snow and ice conditions are still fresh in your mind. We'll gladly supply complete information.

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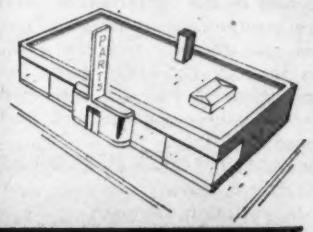

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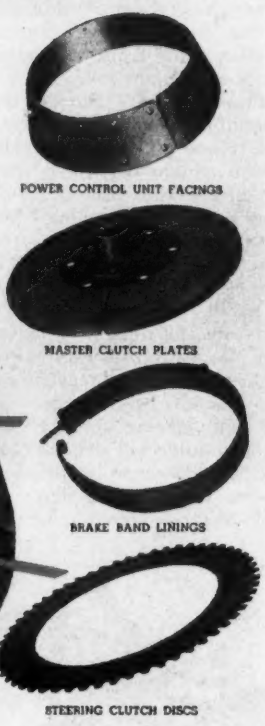

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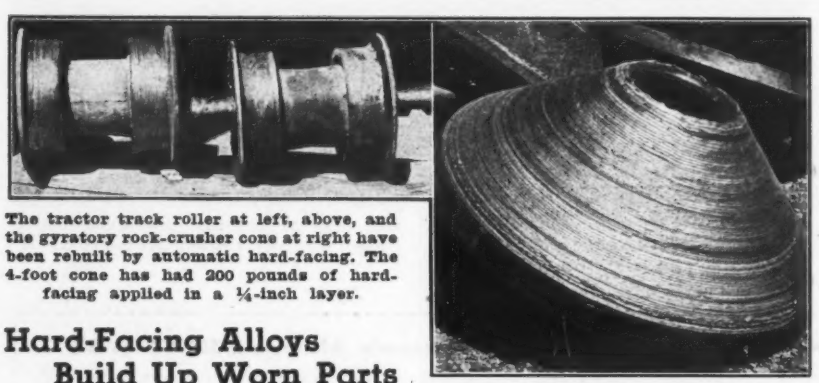

The tractor track roller at left, above, and the gyratory rock-crusher cone at right have been rebuilt by automatic hard-facing. The 4-foot cone has had 200 pounds of hard-facing applied in a ¼-inch layer.

Hard-Facing Alloys Build Up Worn Parts

A welding wire in coil form for use in automatic hard-facing operations has been announced by the Stoody Co., 1136 W. Slauson Ave., Whittier, Calif. This material is designed for use on parts on which hard-facing may be laid in a series of continuous stringer beads. This may be on a cylindrical piece where beads are placed circumferentially, or on flat work where the deposit may be made as a series of straight longitudinal beads.

Welding processes of this kind are important in the construction industry where equipment pieces such as the rollers and idlers of tractors, gyratory cones in rock-crushing plants, brake drums, sheaves, etc. are subjected to severe abrasive conditions and must be replaced regularly.

The method of fabricating these hard-facing alloys, Stoody explains, permits a wide variation in analysis to meet specific conditions such as abrasion, impact, corrosion, heat, as well as any combination of them. Wires can be produced to operate under any given conditions; some applications indicate the use of submerged arc welding, whereas, in other cases, an open arc would be more desirable from an economical or control standpoint.

At present, the Stoody Co. offers seven different hard-facing wires in coil form. Some of these are similar to present manual electrodes which have been in common use for years, while others have been developed for specific wear problems.

The company says that most automatic electric heads now on the market will handle these wires or can, without a great deal of difficulty, be adapted to them. The only difficulty thus far encountered is the feed mechanism, which up to now has been designed to handle solid welding wire. Since Stoody wires are of tubular construction, they are subject to deformation under extreme pressure. For this reason, the feed rolls should be grooved to fit exactly the wire being run through them. This will permit positive feed without excessive pressure, the company explains, and assure an even uninterrupted deposit. Positioning equipment, fixtures, and jigs to operate with the automatic head are, as a rule, fairly simple. Some manufacturers prefer to furnish these along with the welding heads.

Complete data on the Stoody wires —their purposes, characteristics, applications, and dimensions—have been prepared and can be obtained from the company. These wires, known as Stoody 101, 102, 105, 120, 121, 122, 130, and the Stoody manganese, are said to cover the entire range of applications for both maintenance and manufacturing operations.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 31.

Gradall Dealers Appointed

Two new distributors for its multi-purpose earth-mover have been appointed by The Warner & Swasey Co. of Cleveland, Ohio. J. C. Georg of Syracuse, N. Y., will handle distribution of the Gradall in eastern New York State, with the exception of metropolitan New York City. J. P. Waite, Inc., 3304 W. Pierce St., Milwaukee, Wis., will handle Gradall sales in Wisconsin and the upper peninsula of Michigan.

Stand-By Electric Plants

The use of its power units for stand-by service is the subject of a 2-color 17 x 20-inch broadside issued by D. W. Onan & Sons, Inc., 4843 Royalston Ave., No., Minneapolis 5, Minn. Entitled "Onan Standby Everywhere", it describes how Onan stand-by emergency electric plants are designed to give protection from break-downs of electric power lines.

A table of capacities and specifications of Onan emergency plants is contained in the broadside, plus a description of the Onan automatic ac line-transfer controls. These are designed to switch over the electrical load to the stand-by unit within seconds after main-line power fails. One side of the folder reproduces testimonial letters received from owners of Onan stand-by equipment.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 75.

FRONT END LOADERS
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½ and ⅝ cu. yd. capacity.
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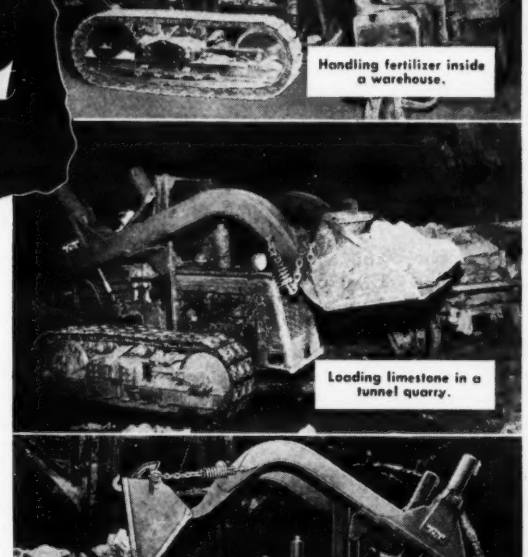
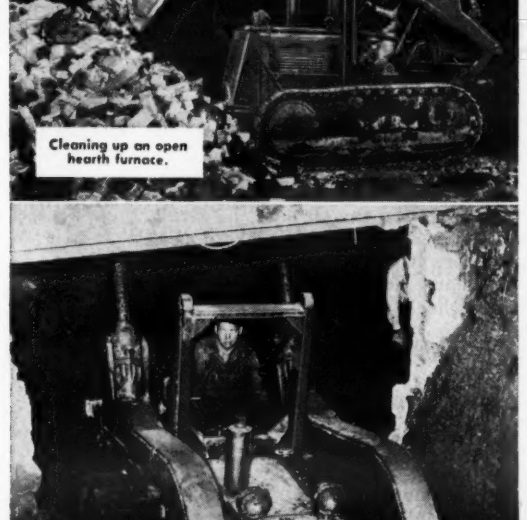

Loading limestone in a tunnel quarry.


Cleaning up an open hearth furnace.

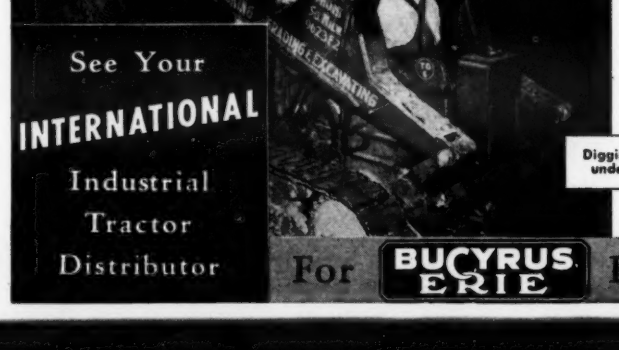
Digging basements under buildings.

MANY jobs you'd ordinarily have to turn down — because of excessively low clearances and close quarters — are in the "routine" class when you're equipped with a Bucyrus-Erie DOZER-SHOVEL.

Look at the illustrations on this page . . . here are DOZER-SHOVELS at work in such "inaccessible" places as a warehouse, a tunnel quarry, a blast furnace . . . here, too, are DOZER-SHOVELS doing such "impossible" jobs as digging garages and basements under existing buildings!

DOZER-SHOVELS are so compactly built that you can easily move them through low, narrow openings, and so maneuverable you can work them at top speed in narrow confines. That means you can take advantage of DOZER-SHOVEL performance features — the speed, dependability and durability for which they're famous — in the many extra ways that help build earnings.

See your International Industrial Tractor Distributor for complete information about DOZER-SHOVELS for T-6, TD-6, T-9 and TD-9 crawler tractors. Bucyrus-Erie Company, South Milwaukee, Wisconsin.



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For BUCYRUS ERIE Balanced Tractor Equipment

A Bidding Mistake— What to Do About It

Relief Can Be Secured by Correct Procedure; a Suit In Equity May Recover Deposit Made With Bid

By NELSON ROSENBAUM, Counselor at Law; Former Assistant Corporation Counsel in the Contract Division—Law Department of the City of New York

THE possibility of error in preparing a bid is always present. Working under pressure within short time limitations can cause mistakes. And this is especially likely when complicated technical situations, such as engineering plans and specifications, must be accurately analyzed in order to understand the project, to estimate the quantities of required work, and to calculate or secure prices on which to base the final bid price or prices.

These are the circumstances under which contractors, their engineers, and their estimators invariably work when preparing a bid. It is surprising that so few mistakes are made, since a myriad of details must be explored in proper sequence and then finally collated.

A contractor's mistake in bidding may prove disastrous, especially when it means a price below his actual job cost. A recent press report told of a well known and substantial contractor of great experience who submitted a bid of $5,000,000 for building pier abutments. His bid was nearly $1,000,000 below that of his nearest competitor—because he forgot to include in it the item of concrete forms costing $500,000. A deposit of $100,000 which the contractor submitted with his bid was forfeited, according to the press report, because he did not go through with the contract.

This incident highlights the need for a contractor to understand his legal rights when he makes a mistake in bidding, so that the forfeiture of his deposit may be prevented; or, if forfeited, so that he can establish the right to be entitled to its return. This information should also be desired by awarding officers and owners who wish to be known for maintaining a standard of fair practice in dealing with contractors.

Kinds of Mistakes

Mistakes in bidding can be of two kinds: (1) those made by the contractor himself in interpreting the plans and specifications, or in mathematically computing the quantities or prices making up part or the whole of the bid; and (2) the contractor's use of incorrect information furnished by his proposed subcontractors — incorrect because of mistakes *they* made in interpreting or computing.

A bidder who discovers before the contract is awarded to him that he has made a mistake in bidding has two choices. The first is not to report his mistake to the awarding officer and to accept the contract, if awarded to him. This procedure avoids the possibility of having his deposit forfeited, if one was required, and the resulting expense of litigation to secure its return. The second choice is the point of this discussion and will be elaborated more fully.

How to Avoid Loss

A bidder who has made a mistake in his bidding is not without remedy to cure his mistake and avoid loss to himself, if he follows certain procedures. If he acts promptly, a court of equity will relieve such a bidder of his mistake. It will permit the rescission of the contract awarded to him on his misconceived bid. It will order the forfeited deposit returned to him or it will exonerate him from liability on his bid bond.

It should be pointed out that the purpose of a bid deposit or bid bond is not to penalize a contractor who has made a genuine mistake in his bid. Its purpose is to prevent a bidder whose bid is free from mistake from welching on his offer with immunity. The equitable principle which relieves a mistaken bidder from the contract awarded to him is this: there is an absence of reality in his consent to the erroneous bid. In other words, what the bidder intended is different than what is expressed in his bid. Or his price is based on a misunderstanding of the terms and the proposal for bidding, which may include the plans and specifications.

Stress must be laid on the fact that

(*Concluded on next page*)

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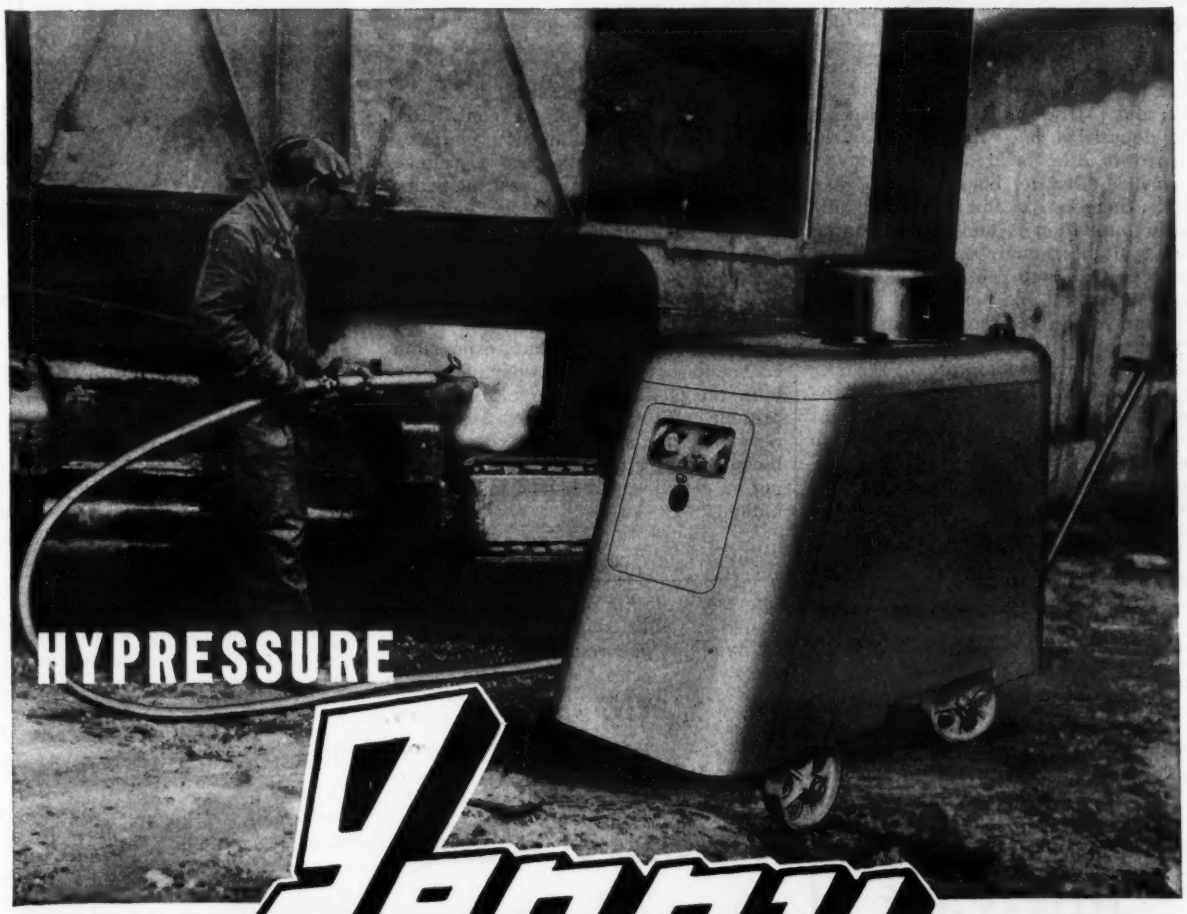

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A Bidding Mistake— What to Do About It

(Continued from preceding page)

a contractor is required to follow this equitable theory if he is to secure the return of his forfeited bid deposit and avoid liability on the contract awarded to him on a mistaken bid. For the "law side of the court" does not recognize the right to rescind a contract because of a mistake. Accordingly, to sue at law for the return of the forfeited deposit, on the basis that it was forfeited, places the contractor in a legal position where no remedy in his favor exists.

Steps to Follow

Where bids are simultaneously received, opened, and announced, which is the usual practice in competitive bidding, the opportunity is present for a bidder to judge from such opening whether he has made an error in bidding—particularly when he is the low bidder and is likely to receive award of the contract.

When a low bidder has determined that his bid is the result of error, the proper practice for him to follow, if he wishes to avoid the contemplated contract, is as follows: (1) he should advise the awarding authority before the award is made, preferably in writing, that he has made a mistake in bidding; (2) he should indicate the nature of the mistake; (3) he should request that he be permitted to withdraw his bid; and (4) he should request that his bid deposit, if one was made, be returned to him, or if a bid bond was furnished, that he be relieved of liability thereon. If this is done, sufficient foundation is laid for instituting the equitable action discussed earlier to secure the return of the bid deposit or to cancel the bid bond.

There are some states in this country which do not recognize the right to rescind a contract because of mistake —particularly where the deposit is required by law as a condition precedent to bidding for public contracts and to be forfeited when the contractor refuses to execute the contract awarded. Consequently, it is important for any contractor who is bidding to know whether the law of the state where his bid is submitted permits the rescission which we have just discussed.

If the bidder is denied permission to withdraw his erroneous bid before its acceptance, he cannot sign the contract under protest, reserving all rights out of his mistaken bid so as to be able to sue for the sum which was left out of his bid by error (the difference between the mistaken bid price and what should have been the correct bid price) after the job is completed and the contract price paid. This is so because it is considered unfair to require an owner to pay more than he contracted to pay when the contractor, with knowledge of his own mistake, agreed to accept the stated contract price for the work called for under the contract.

Awarding Officials' Attitude

To public awarding officials, the question of relieving a bidder of an erroneous bid is always a vexatious one. This is usually not so with private owners, since they are not subject to the close scrutiny that attends the action of public servants. Nevertheless, when the low bid is out of line and the unfortunate bidder demonstrates his error, it would appear to be sound administrative discretion for a public awarding official to relieve such a bidder from his bid.

If this is not done, the public secures a contractor reluctant to perform his bad bargain, financially disastrous to himself. And this often leads not only to acrimonious disputes, but delayed, dispirited, and possibly skimped performance. A mistaken bidder should not be awarded a contract known to be based on his erroneous bid, for to do so is to ask for "something for nothing" at the expense of the contractor.

A spirit of fair dealing with contractors, shown by a willingness to relieve them of bids based on honest mistakes, is a good investment for owners, whether they be public or private. For such a practice invites more bidders on subsequent contracts, which in turn means more competition and better prices.

Despite all the care that responsible contractors take in preparing their bids, the possibility of error is always present. Since contractors are ordinary mortals, and do not possess the blessings of infallibility, they should not be penalized for honest mistakes in bidding.

The national goal of the American Red Cross 1948 fund drive is $75,000,000. The work of this organization is supported by public contribution. Do your bit by giving generously.

Dual-Use Flame Thrower

A folder describing its dual-purpose flame-throwing unit has been put out by Bready Bros., 5003 No. Cumberland Blvd., Milwaukee 11, Wis. Due to its special construction, this unit can be used as a flame thrower, or as a source of air for high-pressure-spraying operations.

The folder points out construction and operational features claimed for the Torcheat unit. Drawings illustrate many uses for the machine and text material explains how it fits each of these applications. Also contained is a brief history of the development of the unit, showing how the various features were devised and designed.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 67.

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BUY all the Bonds you can
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New Bridge Finished Despite Flood Delay

Concrete and Steel Span Replaces Old Structure That Failed When Piles Gave Way Under Pier

✦ THE Tennessee Department of Highways has just added a new 550-foot 9-inch bridge to its system to replace a 50-year-old structure that failed early in 1946 when timber foundation piles collapsed under the main pier. State Route 20 crosses the Obion River on the new span between Heloise and Dyersburg only 8 miles from the Mississippi River into which the Obion empties. High water on the Mississippi through the spring and summer considerably delayed the contractor, Forcum-James Co. of Dyersburg, Tenn. Material shortages also hampered operations. The contractor began construction during August, 1946, and finished the job in January, 1948, at a cost of $325,000.

This section of highway served by the bridge sees considerable traffic even though, from the map, the road appears to dead-end in the Mississippi at Heloise. Heavy tank trucks use it constantly, hauling cargoes of oil from the river docks east of U. S. 51 at Dyersburg and points beyond.

Shortly after the old bridge failed, an enterprising farmer in the neighborhood began operating a ferry back and forth across the Obion; he charged 75 cents a round trip for passenger cars and higher rates for trucks. In three months, according to local reports, he had back the $7,000 he had paid for the ferry in St. Louis. The remaining months of his operating venture were practically clear profit.

Old and New Bridges

The old bridge was 400 feet long. It consisted of one low-truss 90-foot swing span and a high-truss span of 135 feet, with timber trestle bents leading to the central steel sections. The roadway was only 14 feet 6 inches wide, made up of a timber floor supported on timber stringers. Supporting the trusses were circular concrete piers resting on timber piles. The piles under the pier where the two truss spans met rotted away and collapsed, dropping the column at least 3 feet and the truss spans with it.

The contractor removed the old bridge, since the new structure is built on very nearly the same line. Demolition was easy. A cable from a crane was hooked to the individual spans which were then easily pulled over and cut up for scrap.

The 550-foot-9-inch new bridge has a reinforced-concrete substructure of two open-type abutments, four piers, and eight bents. The four piers are supported on untreated-timber piles since they will always be under water. Under the bents and abutments the foundation piles are treated with creosote. The two main river piers are 65 feet high and are connected by a 101-foot-1-inch through-truss span. The trusses are 23 feet high and are placed 29 feet 7 inches apart on centers. On either side are the other two piers, 61 feet high, with connecting spans of 53 feet 4 inches.

On the west side of the river the remaining spans carried on bents are 43 feet, 28½ feet, and another 28½ feet ending in the west abutment. On the east side are three 43-foot spans, and four 28½-foot spans reaching to the east abutment. The rest of the superstructure is of reinforced-concrete slab-and-girder construction, with five girders 1 foot 2 inches wide and of varying depth. The slab is 7½ inches.

Designed for H-20 loading, the superstructure has a 24-foot roadway with a 2½-foot sidewalk on each side. The top elevation of the new structure is at 283.5, or 8 feet above the record flood of 1937.

On Pile Foundation

Work started first on pier 3, the easterly of the two tallest piers. At the time, the water was from 6 to 8 feet deep. To reach the pier location a timber work trestle was built 50 feet out in the river. The trestle extended out from the site of pier 4, which is located at the east bank of the Obion.

The work trestle consisted of 4-pile bents, the two inner piles plumb and the outer piles battered. The piles had 12-inch butts and 8-inch tips, were 30 to 40 feet long, and were driven to 20-ton bearing capacity. Driving was done by a 3,000-pound drop hammer moving in 30-foot swinging steel leads hung from the 40-foot boom of a Marion crane. The bents were on 12-foot centers, and the piles were capped with 10 x 10's, 14 feet long. Between the caps were

(*Continued on next page*)

C. & E. M. Photo
A 3,000-pound drop hammer, working in 30-foot swinging steel leads hung from the boom of a Marion crane, drives timber piles for falsework on span No. 2 of the Obion River bridge.

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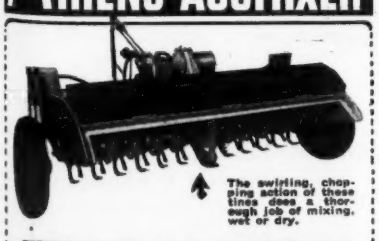

The swirling, chopping action of these tines does a thorough job of mixing, wet or dry.

HERE'S equipment designed especially for mixed-in-place construction—to operate in connection with other general purpose equipment. Whatever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe . . . made 4 standard sizes. 4', 5', 6' and 7'. Write for details.

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★ Perfect Balance; handles easier, fills faster, dumps cleaner.

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MANSFIELD LOUISIANA

New Bridge Finished Despite Flood Delay

(*Continued from preceding page*)

stretched 4 x 12 stringers, 16 feet long. The stringers supported a deck 14 feet wide made up of 3 x 10's.

Out on this work trestle came a Brownhoist steam rig with an 80-foot boom. It drove the steel sheet piling to form a 12 x 52-foot cofferdam for pier 3. The sheeting consisted of 16-inch interlocking M sections from 35 to 45 feet long and was driven by a McKiernan-Terry No. 7 hammer. As the sheeting was driven, it was braced with a ring of 12 x 12 rangers with other 12 x 12 timbers stretched across for struts. Then the cofferdam was excavated by a ¾-yard clamshell bucket from the steam rig, and unwatered by a couple of Jaeger 4-inch pumps.

As a foundation for this pier, 72 timber piles were then driven on 2½ to 3-foot centers by the steam rig and hammer. The piles were 24 feet long with 8-inch tips and 12-inch butts, and were cut off so that they would penetrate a foot into the concrete footing. The footing is 48½ feet x 10 feet x 3 feet deep.

The wooden forms for all the structures consisted of ¾ x 6-inch stock backed with 2 x 4 studs on 12-inch centers, with double 2 x 6 wales on 28-inch centers. The wales were held together with Universal ½-inch tie rods. The concrete in this pier, 65 feet high above the footing, was poured in from 7 to 12-foot lifts. Then the sheet piling was removed with a Vulcan No. 4 pile extractor.

Concrete Operations

At his home office in Dyersburg, 8 miles from the job, the contractor set up a Blaw-Knox 80-ton 2-compartment aggregate bin. One bin contained sand and the other gravel. The bins were charged from adjacent stockpiles by a Northwest crane with a 45-foot boom and a ¾-yard clamshell bucket. The aggregate was purchased from T. L. Herbert & Sons at Johnsonville, Tenn., and shipped by rail 140 miles to the Dyersburg siding of the Gulf, Mobile & Ohio RR in the Forcum-James Lumber Co. yard. The truck haul from Dyersburg to the job site is 8 miles.

Hermitage bag cement was used, and this was shipped to a siding of the Illinois Central RR at Finley on State Route 20, and only 5 miles from the job. Trucks hauled it to the site in readiness for a pour. Reinforcing steel was purchased from the Jones & Laughlin warehouse at Memphis, and hauled 85 miles to the job site in a flat-bed trailer truck.

For concreting, a 3-bag mixer, supplied by wheelbarrows, was used. A Rex 2-bag mixer was held in reserve. Water for the concrete was pumped from the river to the tank on the mixer by a Marlow 2-inch pump.

The mixed concrete was discharged into a Blaw-Knox 1-yard concrete bucket and emptied into the forms with the aid of a Marion crane. Curing was done with wet burlap, and the side forms were left on for 24 hours after a pour.

Other Structures

While this work was going on at pier 3, the contractor also was constructing the east abutment and bents 4, 5, 6, and 7 on the eastern shore. Excavation for these structures was usually done by one of the cranes and a Hendrix 1-yard drag bucket. The creosoted-timber piling for the abutments and land bents was purchased in shipyards along the Mississippi Gulf Coast, shipped by rail to Finley, and hauled out to the job on a pole trailer. The abutments on the old bridge were blasted apart with a few sticks of dynamite.

The concrete bents consist of two footings from which rise twin stems.

C. & E. M. Photo

Looking west across the Obion River, we see the contractor's Brownhoist steam rig partly submerged. It had been working on the left bank when the water rose in one of the many high stages of last spring. At left is the ferry which took trucks and cars across the river after the old bridge failed.

They are connected at the top by a concrete cap. The stems or columns are on 18-foot centers. In the shorter spans the footings are 8 x 6 x 3 feet deep, while in the longer spans they are 8 and 9 feet square. In both, the piles project 1 foot into the concrete. In the structures for the shorter spans each footing rests on 6 piles; the columns are 2 feet square and the connecting caps are 23 feet long x 2 feet 10 inches wide x 2½ feet deep. In the longer spans the structure footings rest on 9 piles; the piers are 2½ feet square, while the caps are 23 feet x 3 feet 4 inches square.

Falsework for the beam and girder construction of these spans consisted of 3 bents to a span, and 6 piles to a bent. The piles were 20 feet long for the first lift which was capped with 4 x 12's. On top of these a second lift was constructed to bring the falsework up to the required height. Most of the form lumber was cut on a C. H. & E. table saw with a 14-inch circular blade.

Heavy spring and summer rains brought construction practically to a halt with the river running bank-full and 20 feet deep. When the river finally subsided, the work trestle was completed across the river in order to construct the remaining piers in the water. Pier 2 is similar to pier 3, and is of solid construction as are piers 1 and 4. The latter two have 48 x 16-foot footings and are supported on 48 piles each. The piers taper to a top width of 3 feet 4 inches.

The truss for the main span was furnished by the Virginia Bridge Co. It was shipped in sections from Memphis to Finley by rail, hauled to the job site, and erected by riveting.

Quantities and Personnel

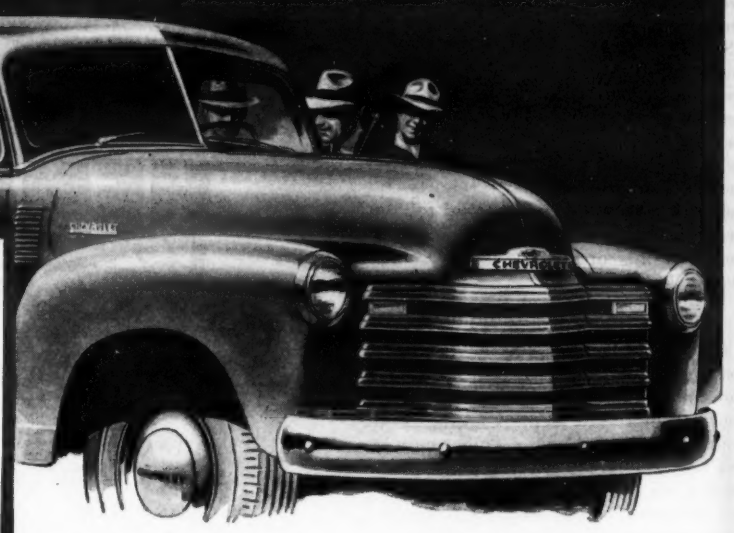
The major items in the contract included the following:

Excavation	2,500 cu. yds.
Concrete	2,852 cu. yds.
Reinforcing steel	229,057 lbs.
Structural steel	130,057 lbs.
Riprap	350 cu. yds.
Treated-timber piles	4,800 lin. ft.
Untreated-timber piles	7,080 lin. ft.

An average force of 25 was employed on the bridge project by Forcum-James Co. under the direction of

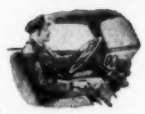
(*Concluded on next page*)

NEW CHEVROLET
Advance-Design Trucks for 1948



Only Advance-Design Trucks for 1948 Have All These New and Finer Features:

★ **New Chevrolet 4-Speed Synchro-Mesh Truck Transmission** Entirely new Chevrolet developed Synchro-Mesh transmission assures truck users of unparalleled new ease and efficency in truck operation!



★ **New Chevrolet Advance-Design Gearshift Control** Unrivaled new convenience and ease of operation in Advance-Design models with 3-speed transmission. Gearshift is mounted on the steering column to provide new efficiency on every hauling job!

★ **New Foot-Operated Parking Brake** Here's a revolutionary new feature of Advance-Design Models with 3-speed transmission. The new Chevrolet foot-operated parking brake provides safer, more efficient braking, plus new, clear floor area!

★ **New Improved Chevrolet Valve-in-Head Engine** The world's most economical engine for its size—Chevrolet's power-packed valve-in-head engine is now *even finer*, with vital new features that assure greater durability and operating efficiency

★ **New Multiple-Feature Developments** Chevrolet's Advance-Design provides new splined rear axle shaft attachment to wheel hubs for greater strength and durability in heavy-duty models. . . . New heavier, more durable springs. . . . New propeller shaft bearing-seal design . . .

The Newest Line . . . The Greatest Features . . . The Biggest Values!

Here are the nation's biggest truck values —with the *latest* and *greatest* features of advance-engineering! They're new Advance-Design Chevrolet trucks for 1948 —107 models on eight wheelbases—built to deliver *Transportation Unlimited!* See them at your Chevrolet dealer's.

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT 2, MICHIGAN

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The Cab that "breathes"* • Flexi-Mounted cab • Uniweld all-steel construction • Large, durable, fully adjustable seat • All-round visibility with rear-corner windows* • Extra-durable frames • Full-floating hypoid rear axles • Specially designed hydraulic truck brakes • Thorough cab-sealing insulation • Standard cab-to-axle-length dimensions permitting interchange of bodies . . . and MANY other fine features.

*Fresh air heating and ventilating system and rear-corner windows optional at extra cost.

CHOOSE CHEVROLET TRUCKS FOR TRANSPORTATION UNLIMITED!

William T. Cutchin, Superintendent. For the Tennessee Department of Highways, G. R. Champion was Senior Resident Engineer and Richard M. Stevenson was Assistant. The project is located in the Fourth Division of which J. C. McCallen is Division Engineer with headquarters at Jackson. The Department is headed by Judge C. W. Phillips, Commissioner, with W. T. Brooks, State Highway Engineer; L. W. Erickson, Bridge Engineer; and O. F. Goetz, State Construction Engineer.

Trailer Line in Sizes From 11 to 75 Tons

Two types of trailers for transporting construction machinery and equipment are made by Transport Trailers, Inc., 1234 Twelfth St., So. W., Cedar Rapids, Iowa. The two types are cargo carriers and Jack-over-Axle styles. The trailers are made in numerous models with four types of rear axles—a single-axle type, a two-in-line oscillating type, a four oscillating type, and a tandem type.

The cargo-carrier trailers are available in capacities ranging from 11 through 75 tons. They can be furnished as semi-trailers, or with a specially-designed spring dolly and drawbar for use as full trailers.

The Jack-over-Axle trailers feature a design which is said to have several advantages—to bring the trailer deck nearly a foot nearer to the ground; to allow easier loading over the front end after the front axle is removed; and to drop the frame and lift the load wherever the wheels have traction.

The single-rear-axle trailers are made in 11, 13, 16, 18, and 22-ton models; the two-in-line trailers are made in 16, 19, 22, and 25-ton models; and the tandems come in 18, 22, and 25-ton models. Platform lengths vary from 10 feet to 11 feet 9 inches. Minimum ground clearance for all Jack-over-Axle models is 10 inches. The platform width on these trailers is 8 feet.

Standard equipment for the trailers includes a special high-lift hydraulic jack with linkage for dropping and raising the trailer frame to permit front-end loading; safety chains; D-rings for lashing on each side of the trailer; air, vacuum, or manually operated brakes; a toolbox between the beams at the front of the trailer; a wheel tool with a handle; a front loading ledge; and two loading ramps.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 98.

Wire-Rope Cutters

A hand-operated bench-type cutter for use with rods or wire rope is made by the T. H. Lewthwaite Machine Co., 305 E. 47th St., New York 17, N. Y. The Model C is made in two capacities—one for cutting 1-inch wire rope and smaller, the other for cutting 1¼-inch rope and smaller. It will also cut ¾-inch rods. The Model B is designed to cut ½-inch rods, and the Model A to cut ⅜-inch rods.

The blades for these cutters are made of tempered tool steel, and those requiring extra strength are made of special alloy steel, the manufacturer points out. The body, side, and handle sockets are made of malleable iron. All parts are said to be interchangeable.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 49.

Richkraft Appointments

Jason D. Radding has been appointed Sales Representative by the Richkraft Co., Chicago manufacturer of concrete-curing compounds and building papers. Mr. Radding will cover Maryland, eastern New York, eastern Pennsylvania, New Jersey, and the New England states.

Potts-Farrington Co., 1224 Cherry St., Philadelphia, Pa., has been named a distributor. The company will cover eastern Pennsylvania, south-central New Jersey, Delaware, Virginia, and the eastern shore of Maryland. It will handle the complete line of Richkraft building papers.

Mechanical Rubber Goods

The sixth edition of its catalog called "Manhattan Rubber Products for Industry" is now being distributed free upon request by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. Many mechanical rubber products and special items manufactured by Manhattan Rubber are described in this catalog, with particular emphasis on transmission and conveyor belting, V-belts, hose, engineered molded products, rubber roll coverings, tank linings, and abrasive wheels.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 80.

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TRANSPORT TRUCK MIXER

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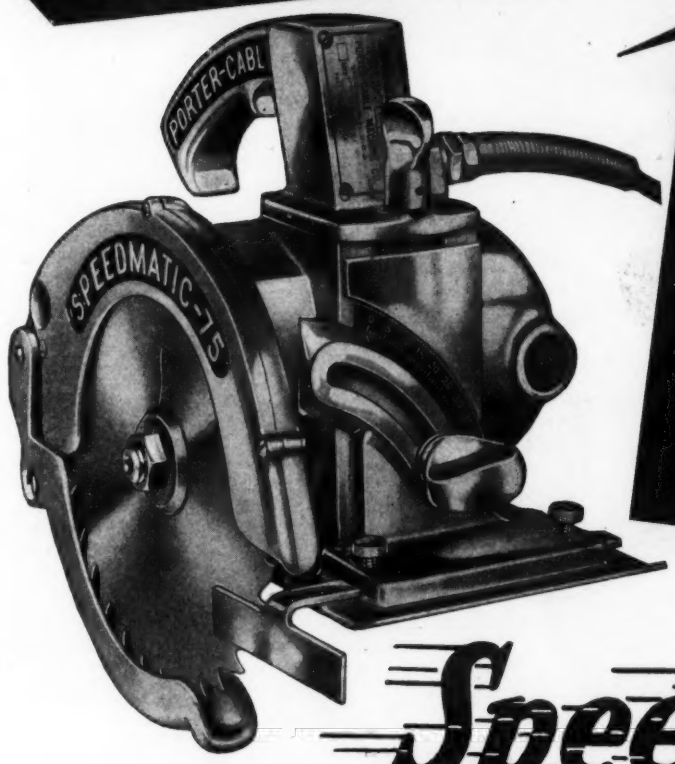
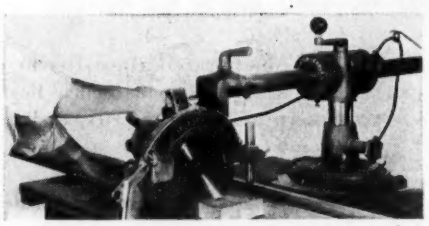


A Carpenter does 10 TIMES MORE SAWING

*Speed*matic



Has Retractable Radial Arm for Extra Utility!
Unlike some power saws, the Radial Swing Arm of the Porter-Cable SPEEDmatic does not obstruct the operator's view. When he pushes saw out of the way, the arm moves too, leaving the cut and work in perfect view.

With Radial Arm, SPEEDmatic can be set for high production of identically-cut pieces.

Electric HEDGE SHEAR
Trims and cuts shrubs, hedges, border grass and any garden growth up to ½" thick. Bevels. Makes shapes, beautiful curves without practice. Weighs only 5¾ lbs. Only $34.50

That's saying plenty! For longer hours of continuous operation on any kind of cuts . . . Porter-Cable SPEEDmatic actually produces 10 times more sawing than any man you've got. Man! That's meeting high labor and building costs in no uncertain way!

Easier, Faster One-Hand Sawing . . .

Balanced—Broad shoe, correctly placed, permits a steadier, easier cut in any position, at any angle. No veering, no tipping, no twisting.

Faster—Sturdy helical gear delivers 11% more power to the blade which travels at 7000 rpm. Practically feeds itself.

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Canadian-Airfield Report

A report entitled "Airport Runway Evaluation in Canada" has been published in booklet form by the Highway Research Board of the National Research Council. This report was submitted at the 26th annual meeting of the Board by Norman W. McLeod, Engineering Consultant, Department of Transport, Ottawa, Canada. For his paper, Mr. McLeod was given the Highway Research Board award for 1946 for an outstanding technical paper.

This award-winning paper presents carefully derived formulae to be used in the design of airports and highways to withstand the loads imposed by modern transport planes and trucks. These formulae were obtained from an investigation of the runways at a number of Canada's principal airports.

The 133-page booklet, Research Report No. 4B, tells of the system followed in conducting the investigation, of the airports selected, test procedures employed, and other related information. It lists the test results, and compiles them in graphs and tables.

The booklet can be purchased at a cost of $2.00 per copy. Write to the Highway Research Board, National Research Council, 2101 Constitution Ave., Washington 25, D. C.

Automatic-Batching Data

A folder which describes the use of its automatic concrete-batching equipment on the Allatoona Dam in Georgia is being distributed by the Scientific Concrete Service Corp., 724 Salem Ave., Elizabeth 3, N. J. This project is under the supervision of the U. S. Army Corps of Engineers. The general contractor is National Constructors, Inc., Cartersville, Ga.

The concrete-batching equipment used consists of separate automatic scales for aggregates, water, and cement; a moisture-meter scale for quick-testing of water content of aggregates; automatic tolerance control; automatic compensation for water in aggregates; and an automatic graphic recorder of delivered quantities.

The folder covers each piece of equipment separately and goes into detail on its design and operation. It lists the concrete specifications for the job and points out tolerances obtained. It also lists the time required for weighing the various kinds of batches.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 71.

Curing-Materials Company

The Gasteiger Co. has recently been formed to handle the sales and distribution of concrete-curing materials. This company has been appointed exclusive sales agent on a national basis for Barclay Home Products, Inc., manufacturers of Kurekoat cotton quilts. Other items handled include products of the Mineral Pigments Corp., and Rodemetal Products. Offices are located at 101 Park Ave., New York City.

No Hill Too Steep

. . . and, we hasten to add—*no mud too deep, no going too rough and rugged.*

Unlike conventional-type trucks, Marmon-Herrington *All-Wheel-Drives* have live power and traction in *all wheels.* With front wheels pulling, rear wheels pushing, they are built to carry peak pay-loads—where you want them, when you want them—in all weather, under all operating conditions . . . on the highway—*or off.*

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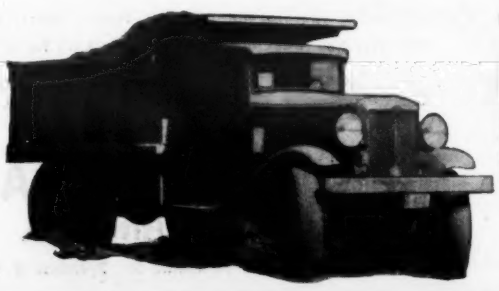

MARMON-HERRINGTON
All·Wheel·Drive

Tunnel Bore Driven Through Lava Ridge

27-Foot-Diameter Tube 10,000 Feet Long Shot Through Hard Basalt to Carry Irrigation Water

(*Photo on page* 1)

✦ HALFWAY up to the top of coulee rimrock 2 miles south of Coulee City, Wash., the muffled thump of tunnel blasting is echoing across the barren country beyond the north portal of Bacon Tunnel. Once every eight hours the long blast of 42 delayed-action shots marks another 11-foot breakout of rock in what is now one of the most important pieces of tunnel construction in the United States.

The San Francisco contracting firm of T. E. Connolly, Inc., is pushing the 10,000-foot Bacon Tunnel, 27 feet in diameter in the rough, through a long, high lava ridge which lies across the path of the gigantic irrigation works crawling from Grand Coulee Dam south towards 1,029,000 acres of rich but dry land in the Columbia Basin of eastern Washington. The Connolly contract with the United States Bureau of Reclamation totals $3,494,420. It includes construction of Bacon Tunnel, complete with lining, and the building of a 1,000-foot siphon 23 feet 3 inches in diameter.

Bacon Tunnel is to be a key structure in the Columbia Basin irrigation development project. (See C. & E. M., Jan., 1948, pg. 6.) It will carry Columbia River water south towards the project. Designed for a Q-factor of 6,600, it will carry exactly half the 13,200 cubic feet per second of irrigation water required for the thirsty land to the south. Later, when the project is a reality and extensive irrigation begins, another tunnel and siphon of equal size will be constructed across the same coulee and ridge.

Started September 19, 1946, the drilling of Bacon Tunnel is expected to be finished by this spring. Big, ruddy W. D. "Bill" Connolly, member of the Connolly partnership, is in charge of the job as Project Manager. Tunnel operations are under the direct supervision of Milan A. "Mike" Roych, soft-spoken veteran of many a tough tunnel job, including waterlogged San Jacinto Tunnel of the Metropolitan Aqueduct, near Banning, Calif. The Connolly organization has a long record of tough tunnels to its credit, including famed Golden Gate tunnels and the Oakland-Bay Bridge tunnel which was lined before the core was removed.

The Bacon Tunnel is a straight job of hard-rock driving, with tricky blocked basalt rock a constant problem to shoot. But the 10-inch overbreakage allowance, called the "B" line, is not often exceeded. And sometimes the miners have to trim jutting rocks to get back to the "A" line, the minimum opening acceptable to the Government. Otherwise the tunnel is straight throughout its length, with a uniform fall of 0.00187 from the north portal towards the south.

Pilot Bore Was Necessary

When the job began, Bill Connolly knew about the geological formation and realized he might strike soft pockets under the ridge which would require steel shoring. It was impossible to get delivery on enough steel to brace the full section of the tunnel if any such pockets were found. Also, steel pipe for the ventilating system was so scarce that some flexible rubberized-canvas pipe had to be used.

Faced with these difficulties, he decided to start tunneling from both portals, driving a 15 x 18-foot pilot bore. This would reduce the amount of steel if soft pockets were found, and when the two upper-half pilot bores holed through, ventilation would be increased.

C. & E. M. Photo
An Atlas locomotive starts off to the disposal area adjacent to Bacon Tunnel.

By August 1, 1947, however, Bill Connolly was out of danger. The south tube, in 4,900 feet, had failed to encounter any very severe conditions. A similar pilot bore from the north end had gone under the ridge 1,900 feet, without difficulties—except for blocky basalt rock

(*Continued on next page*)

GOING PLACES FAST
CAPACITY: (normal conditions per hour) shovel or dragline—60 yards; trench hoe—100 feet of 5-foot ditch.
LOADING FROM STOCK PILE
TRENCHING WORK "ROAD GANG"
DRAGLINE OPERATION
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Unequalled for performance in close quarters, the BANTAM makes money on jobs where heavy equipment is unprofitable. Its full circle design and smooth, FAST CYCLE operation piles up yardage. All major assemblies roll on *ball bearings* for easier handling and longer service life. Its high strength alloy construction is built to take tough going.

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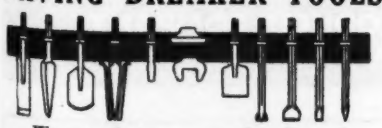

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Tunnel Bore Driven Through Lava Ridge

(*Continued from preceding page*)

—and had required only five steel-rib shores at the tunnel portal. The ventilating-pipe situation had eased. It was therefore decided to take out the lower half immediately on the north end, and to pull 10-foot rounds from the full tunnel face after the 1,900-foot mark was reached.

Pilot-tunnel operations were to continue on the south end until an approximate mid-point of work for the two crews was reached; then they would move back to pick up the lower half. Continuation of pilot work on the south end for another 900 feet would permit that part to be finished without making up a special full-face drilling jumbo. Such a jumbo was built up by Mike Roych for use on the north end.

Shops at Both Portals

To furnish air, electricity, bit-sharpening service, and repairs to equipment, shops were set up at both portals. At the north portal a change-shower shed was built for the miners, complete with lockers, shower stalls, and a pair of Weil-McLain boilers for heating in cold weather.

A compressor house at the base of the rimrock was equipped with two Gardner-Denver 500-cfm air compressors, each driven by a 150-hp Westinghouse motor. A Model WJ3 Sullivan stationary compressor, with an Allis-Chalmers 150-hp induction motor furnishing power, was also located in this shed. Air from these three machines was sent out to the job through two 48-inch x 12-foot receiver tanks and a 6-inch pipeline header. Part of the air from the set-up at the north portal is also being used for drilling rock on the siphon part of the contract.

Also at the north portal, on the level of the portal, is a machine shop and battery-charging shed, and a blacksmith shop where drill steel is sharpened. The shop contains welding equipment, primarily, and a stationary Cincinnati grinder. The battery shop contains a Westinghouse 75-hp motor with a 44-kw generator, a Westinghouse battery charger, and a monorail-mounted Ingersoll-Rand hoist which picks up the 3-ton battery pan from the electric locomotives. This monorail extends from inside the shop out over the narrow-gage railroad tracks, and the hoist can be used to handle many other heavy loads.

The blacksmith shop at the north portal contains two anvils, a forge, an air-driven abrasive grinder, a Gardner-Denver DF-1 furnace, and an Ingersoll-Rand Model 54 drill sharpener. All the shops are either close by the railroad, or have spur lines leading up in their floors.

At the south portal there is a similar set-up. Air-compressing equipment there includes three Sullivan compressors driven by G-E 125-hp motors, and one Imperial Type XRB Ingersoll-Rand with Fairbanks-Morse 125-hp electric power. The project camp also is located at the south portal. It is built of war-surplus tropical barracks made over, and some wooden huts rented from the Bureau of Reclamation. About 130 men stay in camp, out of the 220 on the peak payroll.

Narrow-gage railroad tracks, with rails 36 inches apart, were laid from the portals to the disposal areas just outside and adjacent to the work. The excavated material is being dumped overboard, and the tracks moved towards the edge about 2 feet at a time as fill progresses.

Pilot-Bore Methods

Because of the blocky nature of the basalt, Mike Roych found it necessary to use a 42-hole round on the pilot-bore work. Work was similar at both headings. For this operation he uses a small shop-made jumbo with five Gardner-Denver 99 air drifters, with maximum lengths of 13-foot American Crucible drill steel.

Holes in the 15 x 18-foot heading are spaced on 30-inch centers. Mike uses 5 V-method cut holes in the center of the heading, 4 cut relievers, 8 breast holes, 6 arch holes, 2 back holes, 5 lifter relievers and 6 lifters, and 6 rib holes.

Drill steel with bits from 2⅜ to 1⅞ inches in diameter is being used on the drifters. They drill about 30 inches before dulling. Water from a 130-foot-deep well, pumped up to the drills through a 4-inch pipe by a Pomona deep-well pump, feeds through the drill steel to cool the bits. The 13-foot steel is penetrating its full length, and the rounds on pilot work are breaking out about 11 feet. However, on picking up the bottom section, breakage is from 11½ to 12½ feet and the time is a little shorter.

When the holes are drilled, they are each loaded with from 8 to 12 cartridges of Atlas 60 per cent gelatin and fired from outside the portal by the power line. Ten delays are used in the firing caps, and go off in the order given in the following table:

No. 1	cut holes
No. 2	cut relievers
No. 3	secondary cut relievers
No. 4	lifter and rib relievers
No. 5	rib holes
No. 6	breast holes
No. 7	breast holes
No. 8	breast holes and lifters
No. 9	arch holes and lifters
No. 10	lifters

The time of a blast is 12 seconds, and the finished shots are well broken. The blocky basalt often breaks out in pieces as large as 600 pounds, however, no matter how good the blast. This is one of the conditions which has given some trouble, particularly in wear and tear on mucking machines.

After the blast a Conway mucking machine (the project has two Model 60's in the north heading, a 60 and a 75 in the south) moves in to load the blasted round of rock. Ordinarily about 30 minutes of ventilation are required to clear the smoke and fumes ahead of the mucker. Western 5-yard side-dump cars are being used; there are about 40 on the job. The excavated rock is then taken outside the tunnel by one of four Atlas electric locomotives, and dumped in the waste area. Two Plymouth locomotives, diesel-driven, take the trains

(*Continued on next page*)

HUNT PROCESS ON GIGANTIC COLUMBIA BASIN PROJECT

Photo shows a portion of transition canal being cured with Hunt Process White Pigmented concrete curing compound, providing curing and temperature control in one operation.

"Hunt Process White Pigmented" is the standard "Hunt Process Clear" to which has been added sufficient white pigment to provide proper color and hiding power. It will meet U.S. Bureau of Reclamation Specifications.

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- FAST Especially designed cutting blade and dies combines fast cutting action with the hammer principle eliminates any special skill requirements.
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Give HOPE to the 1 in every 8 persons now doomed to die of cancer, and to their families as well.

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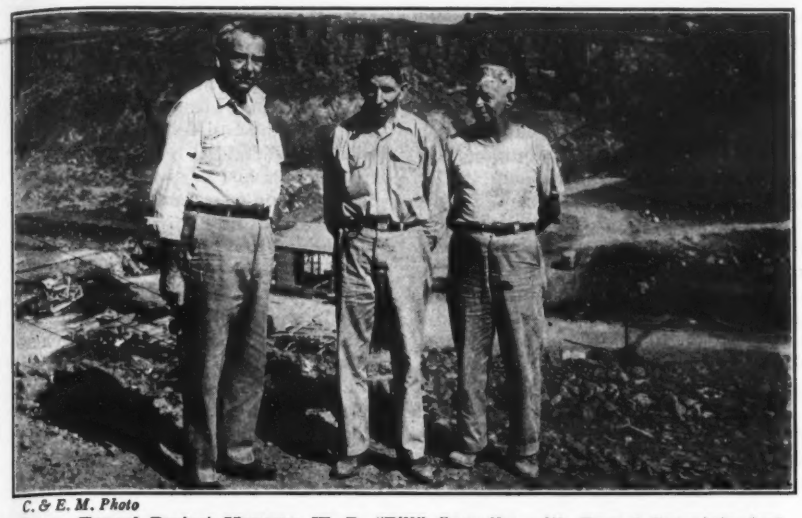

C. & E. M. Photo
Bacon Tunnel Project Manager W. D. "Bill" Connolly, with Tunnel Superintendent M. A. "Mike" Roych and Concrete Superintendent Louis Carpenter.

at the south portal where the haul is longer.

Certain safety precautions are followed religiously all during the 7¾-hour period it has required to muck out and drill one of these rounds. For one thing, the inside of the tunnel is lighted brilliantly, so that men can see the railroad tracks and ties. No man enters the tunnel without a hard hat. When a blast is pulled, the shift boss is the last man to step to safety, and then only after he has made a careful examination of the tunnel.

While the Conway mucking machine works, especially in picking up the bottom half section, men with long steel bars gouge loose any rock fragments in the ceiling. They go over the tunnel foot by foot. Even down in the compressor shed the electric-motor shell vents opening over the armatures are covered with ½-inch wire-mesh cloth.

A complete round in the pilot bore has averaged 7 hours and 15 minutes since the job was started.

Full-Face Operations

When this job was visited last August, the lower half of the material in the north heading was being picked up and preparations made to shoot the full face as quickly as possible. Mike Roych said he believed that a 10-foot round could be mucked out in 10 hours; that with any luck at all, 30 feet of tunnel could be excavated every three 8-hour shifts. The hole-through date of this month was based on that rate of production.

Drilling requires 2½ hours, loading and shooting another 30 minutes, ventilating ½ hour, at least 6 hours to muck out the 240 cubic yards of broken rock resulting from such a shot, and there is a ½-hour lunch period.

For the full-face operation, each crew has 8 miners on drifters, 8 chuck tenders, 2 motormen, a nipper, a mucking-machine operator, and a shift boss. The full face is drilled on about 30 to 34-inch centers, and there are 64 holes, 8 per drill. The drilling on the full face is more in a V-cut, however.

Certain refinements on the pilot method have been necessary. A special 8-drill jumbo, built of 12 x 12 fir timbers well braced and bolted, carries the drifters and platforms for the miners. The four timber legs terminate in steel railroad-car wheels, which ride on a wide-gage set of railroad tracks in such a way that the cars can pass underneath.

An Ingersoll-Rand air hoist has been mounted on a heavy crossbeam at the top of this jumbo. Four cable bridles from the hook on this hoist lead down to empty cars, which are picked up above the level of the locomotives. This permits 5-car trains to operate from the heading, in the following manner:

The locomotive with five cars trailing enters the tunnel and pulls up against the car being loaded by the Conway mucking machine. An empty car at the end of the string is picked up high by the hoist back on the jumbo. The locomotive backs out clear of the jumbo, pulling the loaded car. The empty is then dropped to the track. The locomotive pushes it in to the mucking machine, and while it is being loaded another empty back at the end of the string is hoisted.

This process is repeated until the locomotive is hooked to five loaded cars. It then leaves the spare empty at the mucker, departs for the dump with the 5-car train, and as soon as it clears the portal another 5-car train speeds in to the mucking machine to repeat the process.

This scheme saves much time, speeds the loading of rock, and insures a 10-hour round. It sounds a little complicated, but is really simple. The locomotive simply backs in with five empties *hooked to the front bumper*. It leaves with five loaded cars *hooked to its rear*.

The booms on the Conway mucking machines have all been lengthened to 9 feet to allow them to reach all parts of the rock blast. Belt wear on the conveyors has been severe, due in part to the heavy, sharp rock. Belts frequently wear out in 10 days. Quite a bit of difficulty has been experienced with mechanics who were unfamiliar with the Conway mucking machine, for they insist on riveting the joining plates to the rubber belt with hot rivets. According to Mike Roych, good mechanics bore the rivet hole exactly the same as the cold-rivet shank, and in-

(Concluded on next page)

...by men who know costs

Predominance of Cummins Diesel Engines in the diesel fleets of the country's leading contractors is another strong endorsement of of the performance of Cummins Diesels.

Such cost-conscious operators estimate the worth of an engine by its ability to stand up under the demands of the most rugged jobs . . . to operate with minimum downtime and maximum wear-life. They demand a diesel engine built to the highest manufacturing standards . . . a premium engine for premium jobs.

Ask your Cummins dealer for on-the-job evidence of the dependable, economical performance of Cummins Diesels in the equipment of leading contractors in your vicinity.

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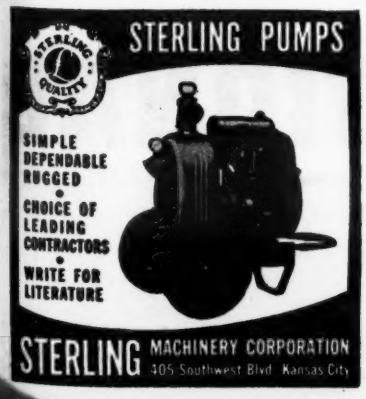


Tunnel Bore Driven Through Lava Ridge

(*Continued from preceding page*)

stall the rivets cold. A better, longer-lasting job is the result, with little or no trouble from rivets pulling out.

Tunnel to Be Lined

Next year, after the excavation of the tunnel is all finished, its walls will be lined with concrete. Bill Connolly plans to pull another ingenious stunt out of his bag of tricks, for the tunnel is so nearly the shape and dimension of the siphon that he plans to use one of the siphon forms. Then after the concrete is in place, grout holes will be jackhammered in through concrete and rock, and the faulted basalt will be sealed forever with an application of high-pressure grouting.

Mess Hall Operates at Loss

It is news when a contractor is proud to operate an item at a loss. Bill Connolly is losing from $1,800 to $2,000 every month, according to Comptroller R. K. Buker, and is happy about it. The item in question is the mess hall at camp, operated by the company for the benefit of its men who cannot find housing at the near-by small towns.

The high cost of living is not only a pain in certain localized portions of the housewife's anatomy; it has also hit the Connolly cook shack. Men pay 70 cents per meal, and 50 cents per night for their bed and linens. But the cost for meals to the company is $1.36, not including the cost of the mess-hall building. It costs the company 51 cents per meal for the food, 40 cents for labor, plus transportation and other incidental costs, all of which add up to a loss.

But Bill Connolly, one of the real old-timers still left in the business, believes in the best food for himself and all his men. On a job in northern California, Bill got up to 270 pounds—is now reducing. The cook-house loss will have to be absorbed in the 217,000 cubic yards of tunnel excavation, which went for a bid price of $9.04 per yard.

Personnel

In addition to Bill Connolly, Mike Roych, and Comptroller R. K. Buker, the Connolly organization has Louis Carpenter in charge of concrete work, and Lawrence Anderson as Master Mechanic.

R. J. Newell is the Regional Director for the United States Bureau of Reclamation, F. A. Banks is District Manager, and H. A. Parker is Supervising Engineer.

Engine-Generator Set

Gasoline-engine-driven electric generator sets in twenty-three sizes and models have been announced by The Buda Co., Harvey, Ill. They are available in dc or ac output, single or triple-phase, and in sizes from 10 to 125 kw. Gasoline engines are standard, but the units can be provided for use with natural gas or butane. The sets are designed for use as stand-by or continuous-duty units. When used for stand-by service, the engine speed is moved up so that a greater kw capacity can be obtained.

The engine used on the low-capacity sets is the Buda Model 4-BG-153; on the high-capacity sets, the Model 6-MOG-970. The generator is direct-connected and conforms to AIEE and AEME standards. The control panel is complete with voltmeter, ammeter, circuit breaker, rheostat, and engine controls. Equipment on the engines includes electric starter, lubricating filter, and air cleaner. The entire unit is mounted on a self-contained base.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 10.

Here a tractor is loaded on a 10-ton Model 7000 Meili-Blumberg trailer.

Tilt-Bed Trailers

A line of tilt-bed trailers in capacities ranging from 1½ to 10 tons is manufactured by the Meili-Blumberg Corp., New Holstein, Wis. Tilting of the bed is accomplished through a hydraulic mechanism. When the equipment is loaded, the platform is said to lock securely into place to assure safe hauling. No uncoupling of the trailer from the truck is required in either loading or unloading. The trailer can be equipped with a hand winch for loading non-powered equipment.

The 10-ton Model No. 7000 trailer features an all-steel welded frame, and a wooden platform with heavy-duty side angles and stake pockets to provide extra strength to the platform. Four over-sized pneumatic tires, a heavy-duty axle, B-K Bendix vacuum-controlled brakes, and a low center of gravity are all features of the Meili-Blumberg trailer.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 23.

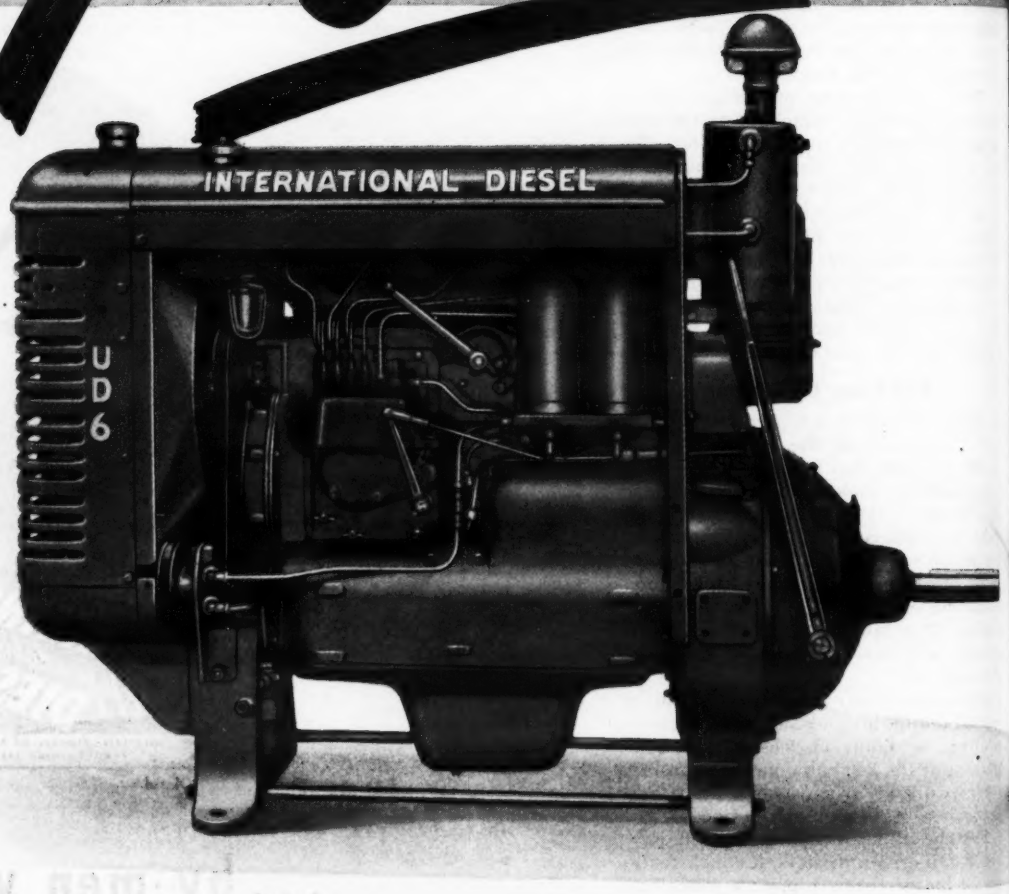
Building-Forms Catalog

A 12-page catalog on the Bulldog concrete forms, used for the construction of walls, columns, beams, and slabs, has been issued by Bulldog Concrete Forms, Inc., 100 W. 42nd St., New York 18, N. Y. It includes a list of twelve features of the forms and ties. And it describes the complete line of equipment, including the Bulldog tool which makes wall-ties on the job.

Blueprints and drawings point out the advantages listed for Bulldog equipment. Catalog No. 10 also lists the general procedure to be followed in erecting a wall form or a footing form.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 59.

Power



39 *working* Horsepower

That's what the International UD-6 Diesel Power Unit, above, delivers at 1500 r.p.m. It has all the features which give Internationals superiority on any powering job! No other make of Diesel has them all. A self-contained starting system permits hand cranking or use of an optional 12-volt electric starter for easy starting regardless of weather.

The UD-6 is a smoothly operating, 4-cycle, valve-in-head engine with advanced design fuel injection; thermostatically controlled cooling; full-pressure lubrication; long-wearing, replaceable, file-hard cylinder liners; induction-hardened crankshaft; heavy-duty precision bearings; sensitive, variable-speed governor with torque control; renewable-element oil filters and a large capacity oil-bath air cleaner. Put it to work and it will give you faithful service for many years.

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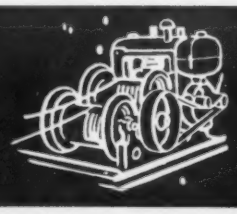
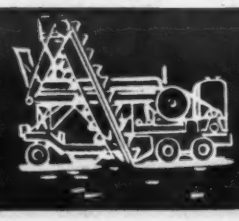




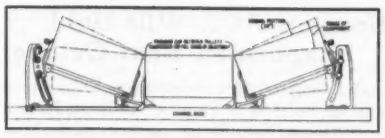
Adjustable Idlers Increase Belt Life

An adjustable troughing idler designed to increase the life of conveyor belts is announced by Koppers Co., Inc., Koppers Bldg., Pittsburgh 19, Pa. The manufacturer recommends these idlers especially for use where an inclined belt changes to a horizontal path, or at the feed and discharge ends of a conveyor.

The idlers are so designed that the outer inclined pulleys are adjustable from slightly above the horizontal, to an angle of 25 degrees. All idler pulleys are located in the same vertical plane, and the outer pulleys are adjusted so as to maintain a constant gap between the ends of the horizontal and inclined pulleys. This gap is kept at a minimum to help eliminate belt damage due to creasing or pinching at such points.

When an inclined belt changes to a horizontal path, the use of a number of these idlers will form a vertical curve said to provide the shallowest depth of trough necessary to retain the material without spill. This shallow trough will also tend to eliminate excessive belt stretch at the edges, the manufacturer states. Using the idlers at the feed or discharge ends of the belt conveyors will allow the belt to be troughed or flattened gradually. This will reduce strain on the belt since it will prevent abrupt distortion of the belt as it enters or leaves the idlers.

The inventor of these idlers is P. J. Conners of the Koppers Engineering & Construction Division. Mr. Conners has assigned his patent to the company.



Koppers recommends its new adjustable troughing idlers for use where an inclined belt changes to a horizontal path or at the feed and discharge ends of a conveyor.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 38.

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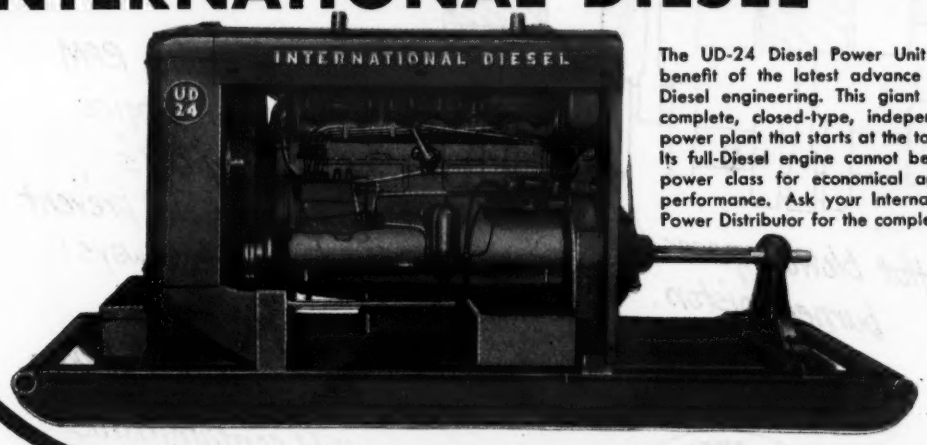

The UD-24 Diesel Power Unit gives you the benefit of the latest advance in International Diesel engineering. This giant of power is a complete, closed-type, independent, portable power plant that starts at the touch of a button. Its full-Diesel engine cannot be matched in its power class for economical and dependable performance. Ask your International Industrial Power Distributor for the complete story.

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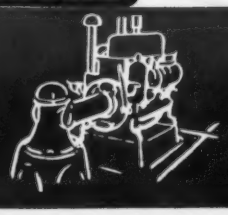
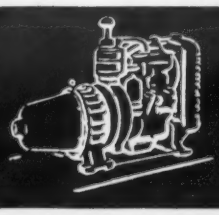




State Hwy. Dept. Aids County Road Engineers

Value of Secondary Road Division Established by State Is Outlined at ARBA Meeting

✦ MINNESOTA'S creation of a Secondary Roads Division within the State Highway Department and the ensuing advantages to county engineers were described recently by Howard Bussard, County Engineer of Lyon County, Minn. Mr. Bussard, who is also President of the Minnesota County Highway Engineers' Association, discussed this subject at a forum on local highway administration at the American Road Builders' Association conference in Washington in January.

This new division has been of value to the counties in two distinct ways, Mr. Bussard said. First, it has increased their every-day efficiency by raising their standards of routine construction and administrative practices. Secondly, it has greatly aided their accomplishments in the Federal-Aid program.

Help in County Work

The every-day work of the county engineer has benefited and his efficiency has increased, the speaker explained, because the new division gives him virtually the status of an employee of the State Highway Department. Although through the new division he has but one office in the State Highway Department to deal with, all the specialists of the highway field are within his reach. With the help of these specialists, he has begun to raise his own standards.

The new division, in cooperation with the Minnesota County Highway Engineers' Association, organized and held an annual four-day institute for county engineers. This institute provided the group with concentrated courses in new developments in the highway field. It also offered them the opportunity to suggest and provide uniform practices for all the counties. Through these meetings, uniform accounting practices were adopted, new budget standards and new designs were put into practice. Many other statewide problems were discussed and solved. In addition, these meetings stimulated each individual engineer and made him anxious to increase his county's standards and efficiency.

Federal-Aid Program

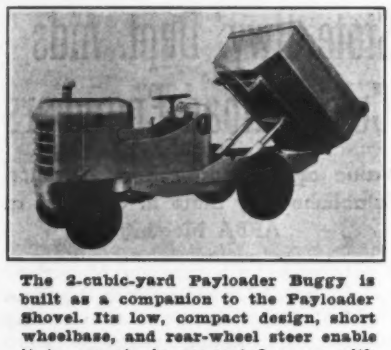
The value of this new division in helping the counties plan and build highways in the Federal-Aid secondary system was also described by Mr. Bussard. He pointed out that of the entire three-year program in Minnesota, 50 per cent is completed or under contract, 30 per cent is planned and being processed for contract, and 20 per cent is in the programming stage. All this, Mr. Bussard said, is being carried out simply and without confusion.

All plans, except bridges, are prepared by county engineers, and all details of construction are carried out on the county level.

Value to Other States

Mr. Bussard believes that similar action on the part of other state highway departments would achieve the same results: increase efficiency of county highway procedure and administration; and provide the right tool to carry out a vigorous Federal-Aid program.

It is impossible to legislate good administration, he said, but creating a secondary-roads division can aid greatly in achieving good administration. And efficient administration must be reached by the counties, Mr. Bussard concluded, before they can expect to secure the increased revenues they badly need to build an adequate road system.



The 2-cubic-yard Payloader Buggy is built as a companion to the Payloader Shovel. Its low, compact design, short wheelbase, and rear-wheel steer enable it to operate in congested areas with low headroom.

New Power Buggy Is Rubber-Tire-Mounted

Rapid and efficient handling of materials is one phase of the construction industry that has received a great deal of attention in the past few years. One of the newest pieces of equipment to enter this field is the Payloader Buggy manufactured by The Frank G. Hough Co., 801-F Sunnyside Ave., Libertyville, Ill. This gasoline-engine-powered unit has a 2-cubic-yard capacity and is mounted on four pneumatic tires. It dumps hydraulically.

All main parts of the Payloader Buggy are said to be interchangeable with the Hough Model HA Payloader Shovel, to which it is considered a companion piece. The steel body is built long, low (overall height is 4 feet 10 inches), and wide to facilitate loading by crane, tractor shovel, or by hand. It has two speeds forward and two reverse, and it features rear-wheel steering.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 24.

Diesel Engine Runs On Gas or Fuel Oil

A Dual-Fuel attachment for use with its D13000 diesel engine has been put in production by the Caterpillar Tractor Co., Peoria 8, Ill. It can be installed at the factory or in the field, and is designed to permit the use of pipe-line gas as fuel where this material can be had.

The attachment consists of special pre-combustion chambers, modified fuel-injection pumps to meter small quantities of diesel fuel, a special governor-control assembly for the interconnected fuel-injection pump and gas-throttle valve, and the necessary gas lines and pressure regulators, Once the initial conversion parts have been installed, it is necessary to change only the pre-combustion chamber in order to convert back to the full-diesel engine, the manufacturer states. This can be done without removing the cylinder head or any of the Dual-Fuel attachments.

With the unit installed, the engine is started on diesel fuel alone, and a single manually operated control lever is used to switch over to natural-gas operation with pilot diesel-fuel ignition. The governor-controlled gas-throttle valve regulates the quantity of natural gas drawn into the engine cylinder. And the modified fuel-injection pumps meter the diesel fuel, timed for positive ignition of the high-temperature high-pressure air-gas mixture.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 45.

Sales Manager for Cleco

W. J. (Bill) Vossbrinck has been appointed Sales Manager for the Cleco Division of The Reed Roller Bit Co. of Houston, Texas. This division has been formed for the manufacture and world-wide distribution of rotary and reciprocating pneumatic tools.

Houston AGC Will Hold Exposition Next October

A Construction Industries Exposition will be held next October 2-10 in Houston, Texas. It will be sponsored by the Houston chapter of the Associated General Contractors of America, Inc., and will be held in the Sam Houston Coliseum. Exhibitors will represent commercial, industrial, municipal, public-works, and residential construction fields.

The first half of each day will be set aside for merchandising, educational, demonstration, and sales meetings between exhibitors and persons or firms of their own choosing. Then during late afternoons and evenings of the show, the Coliseum will be opened to the general public. There will be demonstrations of new materials, equipment and tools, safety devices, construction-apprentice training, etc. Architectural and engineering exhibits will be included.

Leo E. Linbeck is President of the Houston chapter of the AGC. Russell W. Nix, President of the T. B. Hubbard Construction Co., is Chairman of the executive committee in charge of the exposition. Loy W. Duddlesten, Executive Secretary of the chapter, is General Manager of the show, and Milton H. Cohen is Assistant Manager. Exposition headquarters are in the AGC Office Bldg., Gray and Crawford Sts., Houston, Texas.

Boyd of Galion Dies

John S. Boyd, Vice President and Director of The Galion Iron Works & Mfg. Co., died recently at the age of 59. He had been with the company since 1907. Two of his brothers, Ralph E. and C. Findley Boyd, are with the organization at Galion, Ohio. Ralph is President, and C. Findley is Vice President in Charge of Sales.

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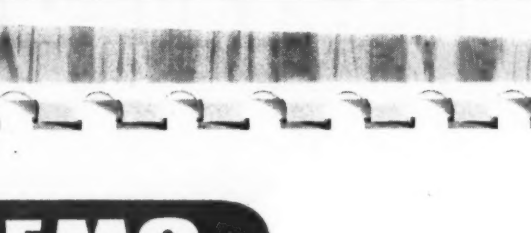

Miller trailers are made to fit every hauling requirement, with 3½ to 10 ton models! "Bulldozer" type shown in illustration will handle International TD-9 with Bulldozer blade. Model "R" for narrow, heavy units like steam rollers. Easy loading under all conditions. Winch optional on all models. NEW! 2-way hydraulic tilting control optional.

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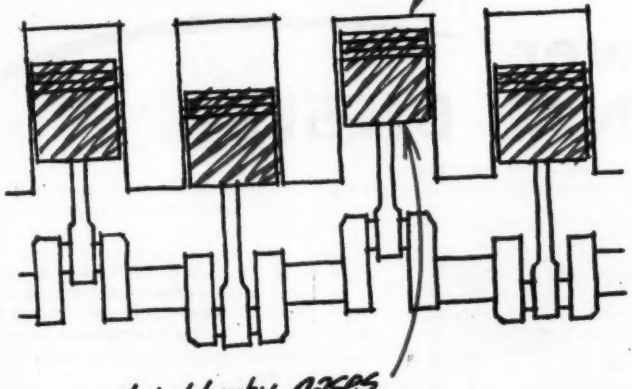

Shop found rings in #2 badly stuck by ordinary oil (blowby has been wasting power).

Hot blowby gases burned piston.

Foreman claims RPM DELO Diesel Engine Lubricating Oil's compounds will prevent stuck rings 3 ways:
1. Decrease carbon
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Give shop go ahead on RPM DELO Oil

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Use of Jacked-in-Place Pipe For Highway or RR Drainage

Advantages, Problems, And Methods of This Type Of Installation Reported For Design Consideration

By DR. JACOB FELD, Consulting Engineer, New York, N.Y.

+ CONTROL of internal soil stability is chiefly a matter of moisture control. Where drainage is to be installed at a considerable depth below the top of an embankment, or where it is not desirable to disturb a developed surface, the economy of introducing drain pipes by static or dynamic jacking should be considered. Jacking pipes under railroad tracks and under heavy-traffic highway pavements has become standard practice.

The procedures have developed as an art with little or no attempt to compute expected loads or required installation forces. This report summarizes the practical development of installation methods. And it evaluates empirical and theoretical resistances which may be used as a guide to the design of jacked-in-place drainage and other pipe.

Types of Installation

Pipes may be installed closed-end when large enough jacking pressures can be provided, and when the soil displacement will not cause undesirable heave at the surface of the fills. Small-size pipes, probably not exceeding 4 inches in diameter, can be inserted by the vibratory impulses from an air-driven jackhammer. To introduce larger pipe into the soil without removing the displaced soil requires too high static pressures and has no advantages.

Up to about 36-inch diameters, open-end pipes must be cleaned of displaced soil either by water jet (preferably combined with compressed air) or by augers, although 24-inch pipe has been installed with hand excavation. Larger pipes can be excavated by hand, with cable-drag scoops or small wheelbarrows to remove the spoil. Static pressures are applied by jacks, either screw or pneumatic type, modified to provide long movement in each throw to reduce the time loss in re-blocking. The forward end of the pipe is usually reinforced by a cutting edge, and in soft ground is protected by a metal shield which overhangs the pipe end. Proper back-pressure resistance must be provided to take the maximum jack pressure, in the form of anchored or braced sheeting in the approach pit, or of deeply inserted piles.

Small-Pipe Installations

Boring. The simplest method for small pipes is to provide a horizontally bored hole by air-driven earth borer. Except in liquid soils, there is little difficulty in preparing a hole for the insertion of a pipe. For such small diameters, the hole will not close up and there is no danger of excessive pressures on the pipe. So minimum standard wall thickness, consistent with expected loss from corrosion, chemical and electrolytic, can be used.

Vibrating Hammer. Closed-end pipe, up to 2-inch diameter, can be inserted in natural or fill ground which does not contain boulders or rock fill with a standard air-driven pavement breaker, using a special driving tool. The length which can be inserted is independent of the depth of cover since the radial pressure on the pipe is small. Careful alignment of hammer and pipe is necessary to keep the pipe point from traveling off line, especially when the amount of cover is small.

Jacking. In 1928, four 6-inch pipes were jacked through a railroad fill at a depth of 19 feet, near Birmingham, Ala. The pipe was standard-weight wrought-iron, equipped with a forged-steel point 2 feet long, welded to a length of extra-heavy pipe. Each pipe was pushed under 10 railroad tracks, for a distance of 200 feet, in 15 hours. The jack was a hydraulic cylinder with 6-inch piston and 5-foot 3-inch stroke, equipped with a motor-driven hydraulic pump. The maximum pump pressure was 4,500 psi but the usual pressure was 2,000 pounds. To maintain proper alignment, about 15 feet of pipe was held in the open approach trench between steel channel guides.

In San Diego, Calif., 100 feet of gas main was laid in 1947 across a busy intersection by drilling through the sections of pipe with an auger drill, taking out 3-foot bites of earth and jacking the pipe into the hole.

Fusion Piercing. In extremely hard ground, the process of "Fusion Piercing", patented by Linde Air Products Co., can be employed to penetrate solid strata. The method was developed for reducing the cost and time of drilling blast holes in iron ore. A hole is made by burning a mixture of oxygen and a flux-bearing fuel and directing the flame against the end of the cavity. The flame temperature of 4,000 degrees F causes some rocks to spall and flake and others to melt. Pressure of the flame gases forces the flakes or molten material past a water spray. The sudden heat exchange further pulverizes the hot rock or soil, and at the same time changes the water into steam under pressure within the restricted volume of the excavated hole. Such steam under pressure automatically cleans the hole of rock and solid chips.

Six-inch-diameter holes 30 feet deep were Fusion-Pierced in a low-grade abrasive iron ore at an average rate of 10 feet per hour. In this type of material, ordinary drilling speeds average 1 foot per hour. Pipes inserted in holes so prepared have no exterior loads to carry, since the fusion of the annular

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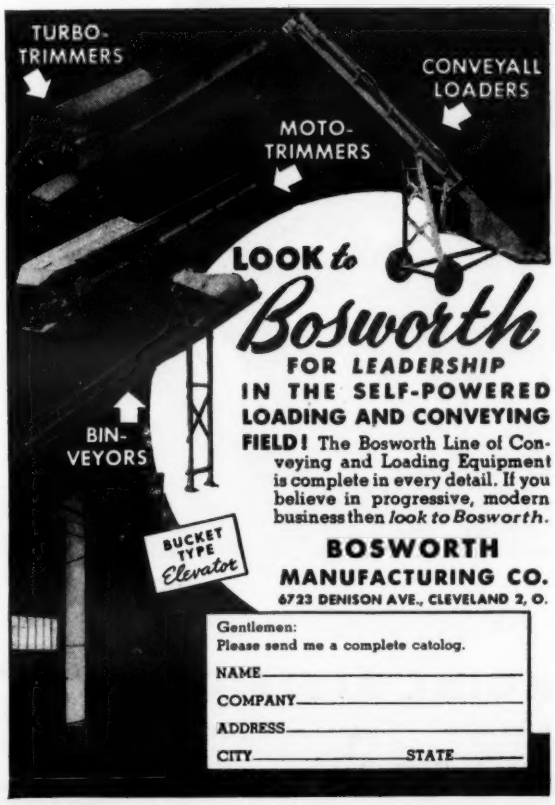

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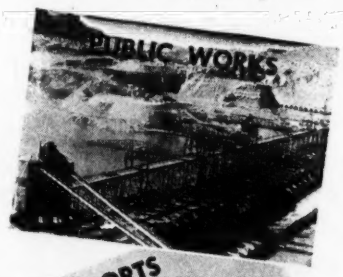

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Jacked-in-Place Pipe For Roadway Drainage

(*Continued from preceding page*)

volume around the hole solidifies the material to form, in effect, a structural tunnel which can transfer overburden and lateral loads into the undisturbed soil regions.

Water Jets Jacked. Horizontal driving of well pipes for water collection, a method developed by Leo Ranney of Ontario, Canada, can be used also as drainage-pipe installations. At Canton, Ohio, 36 separate 8-inch pipes were jetted outwards through the sides of a shaft, 12.5 feet in diameter and 147.5 feet deep. The maximum length of 8-inch screen pipe was 175 feet. Each slotted screen pipe was fitted with a hollow cast-steel conical digging point which had slots in the wall and was connected to an interior 2-inch bleeder pipe. As the pipe was projected by hydraulic jacks, the displaced fine soil came through the screen pipe into the shaft; about 3 cubic feet of sand was removed for each foot of pipe projected from the shaft.

A similar system was used to dewater the ground in the vicinity of the Brooklyn end of the Brooklyn-Battery vehicular tunnel in New York City. From the bottom of a vertical shaft, 11.5 feet inside diameter and 70 feet deep, twelve 8-inch screen pipes, totaling 1,100 linear feet, were projected by hydraulic jacks. The digging head was bullet-shaped with slots and was connected to a 2-inch bleeder pipe to remove the displaced soil, flowing through the slots under hydrostatic pressure. The water-table level was about 50 feet above the pipes. To avoid excessive soil removal, fine screens filtered out all coarse particles which were displaced. The longest pipe projected was almost 200 feet from the shaft.

Loads and Stresses. Where holes are prepared for the insertion of a pipe or conduit, whether by auger or fusion methods, no loads are immediately imposed on the pipe. But with time, it is possible to have an internal soil readjustment which, from a vertical slip or a lateral squeeze, will impose pressure against the pipe. No special investigation is necessary for loading stresses, since the methods are applicable only to small-sized pipes; and the strength under the three-edge bearing method of ASTM C-14, which probably duplicates the worst possible load application, is 1,100 pounds per linear foot for 4 and 6-inch plain-concrete pipe. The stresses on pipes installed by jetting or jacking are similar to those on large pipes, discussed later.

Large-Pipe Installations

The method of jacking pipes under railroad fills to eliminate the disturbance to track and traffic from open-cut trenching was started by the Northern Pacific Railroad prior to 1900. At first this method was limited to cast-iron pipe, and soon became standard practice for several railroads. Corrugated-iron pipe was first jacked in 1922; precast concrete pipe was first used in jacking operations in 1927. The smallest practical size is 30-inch, and the largest size reported is a 96-inch reinforced-concrete section used for a pedestrian underpass, and a 96-inch 8-gage corrugated-iron culvert.

There is a gap in size from 6 to 30-inch, because excavation by methods other than hand shovel and wheelbarrow require special equipment. There is no justification for avoiding the sizes smaller than 30-inch, because water-jet excavation within a pipe can be performed under control without danger of slides and soil failures at the front of the pipe.

Precast Concrete Pipe used in jacking installations should be reinforced-concrete culvert pipe (ASTM C76), preferably extra-strength. The difference in cost between "extra-strength" and "standard-strength" is small insurance for the expensive correction should a pipe section break from unequal jacking strains. Pipe lengths should be 4 feet; where specially manufactured for the job, longer sections will expedite the work, especially if the jacks have a run of more than 4 feet. Since the projections of the bells would greatly increase the soil resistance, pipe joints must not be of greater outside diameter than the pipe being jacked, even though the cutting edge may project beyond the pipe circumference.

Steel-pipe installations are all of corrugated or fluted plate shells, coupling short lengths together. Standard-weight steel pipe can be used if the short lengths are either welded together or, for smaller sizes, connected by means of internal sleeves such as are used for splicing steel shell piles. In one such installation, 60-inch standard-type Armco corrugated pipes were used, with flat slip plates sometimes covering the end of the leading section. The soil was a fine dry sand overlying hard yellow clay, and both materials were encountered in the heading. The fine sand ran into the corrugations and the joints between sections, causing the pipe to freeze at 26-foot penetration. Operations were continued from the opposite end and 100-ton jacking pressure was sufficient to drive the 54 feet needed for closure, where special precautions were taken to avoid sand runs into the pipe.

Corrugated-iron pipe is obtained in sections from 10 to 20 feet long. Provisions must be made in the access pit for connecting sections by riveting or welding to form a continuous compression unit.

Cast-iron pipe was used in the earliest jacking installations — by the Northern Pacific Railroad prior to 1900, the Great Western Railroad in 1911, and the Southern Pacific in California in 1915. Credit is given to Augustus Griffin, now of Calgary, Alberta, for popularizing the jacking method of pipe installation below railroad tracks. Concrete and corrugated-steel pipe has entirely replaced the use of cast iron because it requires smaller approach pits and because it is easier to manipulate the shorter lengths of pipe.

Excavation Methods

Pipes have been jacked in all types of soil, from liquid mud to rock fills. Excavation procedures depend upon the soils encountered. Generally drainage of ground water can be automatically provided by starting the pipe from the lower end and pumping from a sump in the access pit. In very wet areas, well-points are used to lower the ground water and may even be inserted in the heading to stiffen up running soil.

Hand excavation methods are limited to pipe installations of 30-inch and greater sizes. Short-handled picks and shovels, not more than 18 inches long, can be used to loosen hard soil. In tough clay soils, pneumatic spades cut the heading to proper shape. Boulders can be broken by air hammers or by

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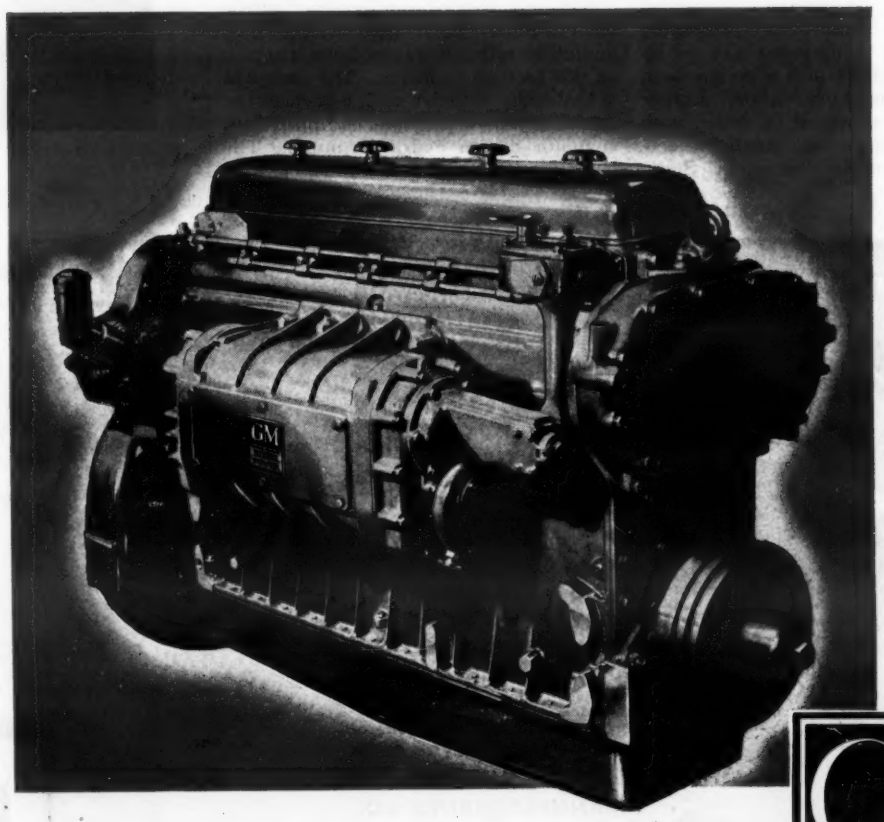
GOOD
KEEP GOOD



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applying heat and water. Oil torches have been used for this purpose.

The size of the excavation depends upon the soil type and the possible damage from loss of soil. In hard ground, excavations can be tunnels 4 feet or more ahead of the lead pipe and several inches larger in diameter, so that the jacking pressures required are low. To prevent the pipe from moving out of line or level, the excavation should be about one inch outside of the pipe at the top and sides, but the bottom must be cut neat. In soft ground, no cutting ahead of the lead pipe is possible, and in very large pipe jobs, timber bulkheads may be needed at the face to brace the heading and prevent cave-ins. In one 8-foot installation, a louver bulkhead was provided, permitting excavation at four different levels.

Excavation in wet and loose soils is difficult and dewatering methods are advisable. Where the ground is soft, or where, as under railroad tracks, no loss or loosening of the soil cover can be permitted, a cutting shield should be extended from the lead pipe. The usual shield is a ⅜-inch steel sheet bent to the shape of the pipe and fastened by bolts or otherwise to the outside of the shell. Projection of the shield from 6 to 18 inches has been used in various installations. With a shield, the excavation must not encroach within the normal slope of the exposed soil, with the cutting edge of the shield fully buried. The shield need not extend lower than the mid-height of the pipe.

In plastic clays, even though there are no cave-ins, loss of ground from the expansion of the exposed heading may cause settlement of the supported track or roadway. In such soils a cutting edge is advisable and excavation should not be carried to the end of the lead pipe. Experience indicates that 18-inch unexcavated protection (for a 60-inch pipe) is sufficient to prevent loss of ground.

Pipe lines will not maintain proper alignment as excavation and jacking advance the heading unless proper precautions are taken. In granular soils, if the joints are not kept free of sand grains, the pipe will rise. In clay soils, a shield will keep the pipe in line. In some cases a steel bar attached to the crown of the lead pipe acts as a guide into the soil and prevents deflection of the pipe from the desired line.

The approach-pit excavation must be large enough to enclose a full length of pipe section, the jacks and their backstops, together with working room for operation of the jacks and for connecting the pipe sections. The subgrade of the pit should provide a guide rail set-up on which the pipe section will rest and slide in the proper direction and desired slope.

Progress of pipe installation depends upon speed of excavation. On one job a 36-inch corrugated-iron pipe progressed about 10 feet per 3-shift-day average during the 200 feet of jacking. A similar progress rate is reported in the 36-inch corrugated-iron pipe line 118 feet long installed in King County, Wash., in water-bearing clay and fine-sand strata. In Lorain, Ohio, a 60-inch Armco pipe in very compact clay was advanced 1.22 feet per hour. A 48-inch concrete pipe was advanced from 14 to 17 feet per 8-hour day in water-bearing sandy soil, with the water table lowered by wellpoints and no excavation allowed ahead of the lead pipe. Daily progress in completing 60 and 72-inch concrete pipe under railroad tracks varied from 5 to 7 feet.

The earlier-recorded installations seemed to tend to continuous operation to avoid "freezing of the pipe". But the time interval between single shifts per day is not long enough to allow any appreciable consolidation of the disturbed ground at the pipe surface. And no trouble has been found from the more economical work schedule of a single shift per day.

Jacking Devices

Jacking devices employed are screw jacks, ratchet jacks, air-piston cylinders, and hydraulic jacks. Only in a well made hydraulic jack can any record be made of acting pressures. The greater ease of operation and better control make the use of hydraulic jacks advisable.

The operation is an intermittent pushing of the pipe forward to the full stroke of the jack piston, retraction of the piston and insertion of blocking, then another push forward. The longer the jack stroke, the fewer stops in forward motion. The ideal set-up is to have a jack stroke somewhat longer than the pipe sections, so that no intermediate temporary blocking is required.

Alignment can be corrected by applying eccentric pressure with single jacks. This is done by offsetting the contact between jack and jacking frame. With multiple jacks, the eccentricity can be applied by varying individual jack pressures, without changing the set-up of equipment. Another advantage of multiple jacks is the possibility of "rocking" the pipe to reduce surface friction, by working the jacks separately for short periods.

The frame which distributes jack pressure into the pipe should be designed to transmit the maximum jack force into the pipe without too much deflection, which would mean a loss in jack extension, and with fairly uniform load application on the full perimeter of the pipe. A wood ring frame to fit the groove of the pipe section, with grillage beams for taking the jack concentrations, is found most suitable.

Sufficient passive soil resistance must be developed for the reaction of the jacks. This is usually accomplished by tight sheeting at the back of the access pit, with vertical beam or rail framework against which the jacking support rests. Where no access pit is required, a backstop of timbers, often railroad ties, is set into the ground, with a diagonal support for the top reacting against imbedded anchorages. The amount of resistance to be used should be half of the maximum passive soil resistance on the imbedded-sheeting area, to avoid excessive deflections and movements into the soil. Resistances of various types of soil and the resisting value of imbedded anchors and piles are summarized in *Proceedings*, Highway Research Board, 1943, pg. 403.

An unusual type of resistance was devised at a Quantico, Va., installation of four concrete pipes running through a railroad fill located in tidal swamplands. Four 2-inch iron pipes were first pushed through the fills at each installation, so located that they were outside of the pipe diameter. Cables were threaded through the pipes, anchored to a timber bulkhead at the far end, and tied to a timber backstop against which two 250-ton hydraulic jacks reacted.

Loads and Stresses

The loads and stresses which must be considered in a jacking installation de-

(*Concluded on next page*)

DIESELS COMPANY

Every day more and more well-known manufacturers of contractors equipment and other machinery are offering the General Motors Series 71 2-cycle Diesel engine as power for their products.

The reason is clear. These tough, dependable Diesels provide great power in moderate space. They start easily—pick up their load fast—run smoothly and use a minimum of low cost fuel.

GM 2-cycle Diesels produce power at every piston downstroke. They are designed for easier servicing; have no high-pressure fuel lines and offer a maximum of interchangeability of parts, engine for engine.

These are the factors which, together with Detroit Diesel's owner service policy and warranty, have earned for GM Diesel its enviable reputation.

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Locomotive Cranes
Logging Loaders
Logging Yarders
Mining Pumps
Motor Graders
Off-The-Road Vehicles
Oil Field Equipment
Pavers
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Pumps
Road Rollers
Rock Crushers
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Stave Mills
Tractors
Trucks
Wellpoint Pumps

IT'S WISE FOR YOU TO SPECIFY GM DIESEL

Jacked-in-Place Pipe For Roadway Drainage

(*Continued from preceding page*)

pend on the type of soil and the method of operation. The earth load carried by a pipe during installation is probably less than the load after the volume of disturbed soil has consolidated. The amount of jacking pressure required to overcome frictional resistance is also dependent upon the type of soil and the method of operation, as well as the length of pipe imbedded. There are a number of cases which must be separately considered.

1. Open-end pipe jacked through a bore excavated ahead of the pipe.
2. Open-end pipe jacked into the soil with excavation inside the pipe only.
3. Closed-end pipe jacked through the soil without any excavation.

Little empirical data is available to check theoretical analysis of any of these cases. Where the amount of jacking pressure at any stated conditions is known, the total radial earth pressure on the pipe can be computed if the following have been recorded: the weight of the pipe and the coefficient of friction between pipe and soil, and the coefficient of internal friction of the soil. Some idea of the range of probable values can also be obtained from the pulling resistance of piles and from the recorded data on shield-tunnel jacking pressures.

The penetration of a pipe laterally into the ground is a somewhat different case than the introduction of a pile vertically into the ground. The frictional resistances, however, are similar—even though in the former case the internal stress of the soil penetrated, prior to the disturbance, is fairly constant—because both are problems in viscous flow. In viscous or linear flow, displacements result from shearing forces acting over a time interval. The frictional resistance of the soil is then (1) independent of the external loads on the surface of failure; (2) equal to zero if the velocity is zero and is directly proportional to the velocity of relative displacements along the surface of failure; (3) proportional to the area of the surfaces in contact.

It is not necessary to determine bending stresses in the pipe during installation, since the loadings are much more uniform than under the worst possible static loading after the surrounding soil has consolidated around the complete pipe. The pipe strength as a column must be investigated, although experience shows that the adjacent soil—even if the pipe is being pushed into a pre-excavated tunnel—provides sufficient lateral support to prevent buckling.

Costs

The cost of installing pipes by the jacking method below railroad tracks or below developed pavements carrying considerable traffic volume is less than the cost of open-cut methods when the backfilling and restoration are included, even if no allowance is made for delay and inconvenience of traffic. Actual costs reported in several of the installations listed in the tables were:

Type of Installation	Cost Per Linear Foot
60-inch concrete pipe, 96 feet long, in a slag-dump fill	(total cost) $25.55 (1936)
60-inch concrete pipe, 84 and 88 feet long	(total cost) 25.98 (1935)
60-inch Armco pipe, 80 feet long with 7-foot cover	(labor cost) 5.20 (1929)
48-inch Armco pipe, 126 feet long with 34-foot cover	(labor cost) 5.00 (1929)
54-inch concrete pipe, 148 feet long	(labor cost) 4.31 (1942)
36-inch corrugated-metal pipe, 200 feet long and 66 feet deep	(total cost) 24.50* (1937)
54-inch concrete pipe, 79 feet long in good soil fill	(total cost) 18.45 (1934)

*Half of total cost was for direct labor in jacking and excavation.

Conclusion

The procedure of jacking pipe for drainage connections and for sleeves to carry sewer, water, gas, or electrical utilities across heavily traveled roadways and through high fills has been developed to a point where costs and construction requirements can be closely approximated. The method should be carefully considered before cutting through an important highway, because it will eliminate traffic hazards, delay, and accidents so common in the vicinity of detours and construction operations.

*From a paper presented at the 27th annual meeting of the Highway Research Board, December, 1947, in Washington, D. C.

Link-Belt Expands in Pa.

The Link-Belt Co. has moved its Pittsburgh district sales office to the former McKay residence at 5020 Centre Ave., Pittsburgh 13. This is the first step in a program designed to expand the company's facilities in western Pennsylvania. Plans are being developed for a new office and factory-branch store buildings to be erected.

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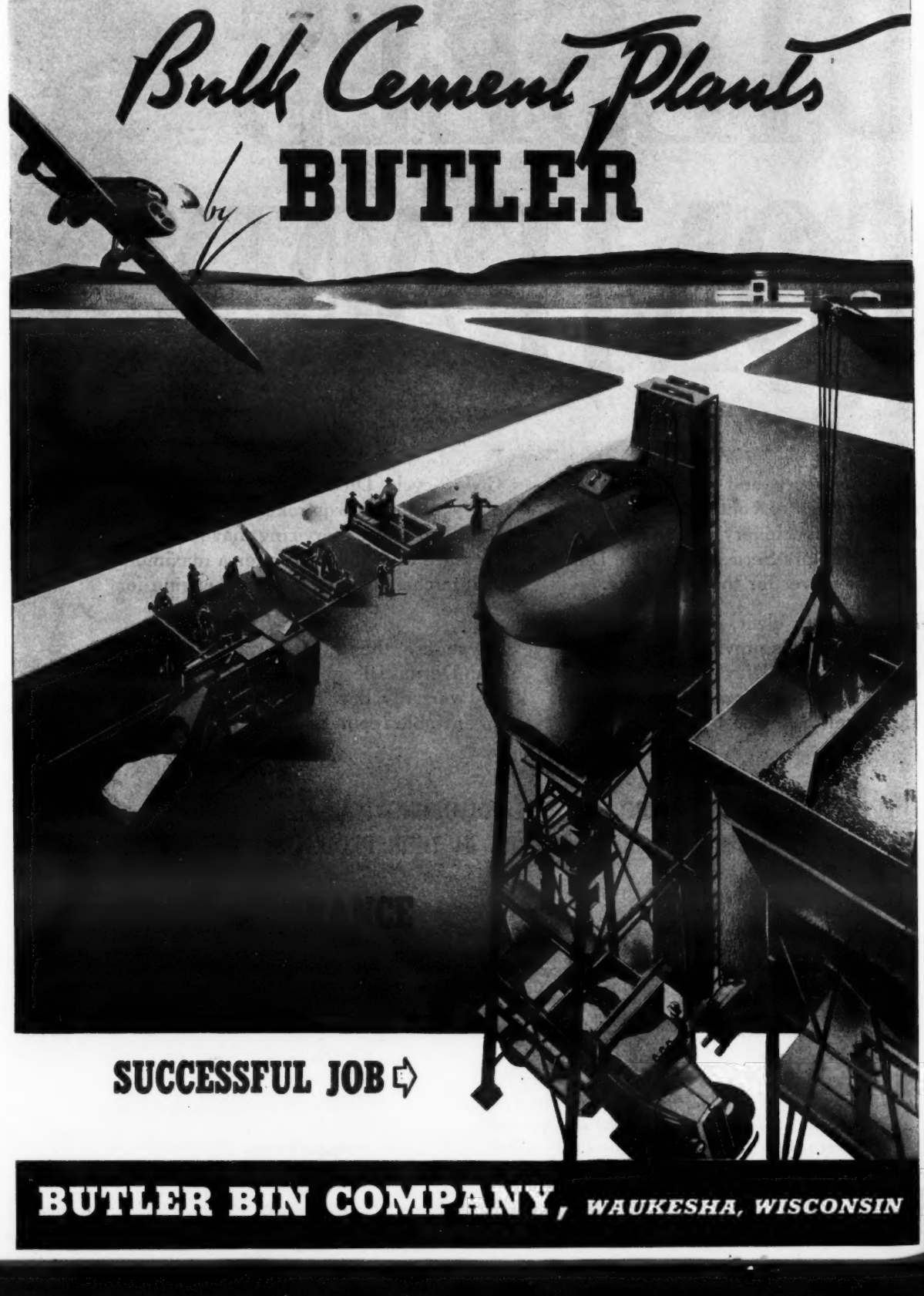

SUCCESSFUL JOB

BUTLER BIN COMPANY, *WAUKESHA, WISCONSIN*

Portrait in Print

By BILL QUIRK

Years as Equipment Operator Prove Helpful to Contractor

A CONTRACTOR may be able to ng a fair tenor, accompany himself the ukulele or guitar, cook a full-course dinner, pilot his own airplane. But if he be unable to operate and repair every piece of construction equipment on his job, he is still shaded for honors in versatility by Jim Lambert of Montpelier, Vt. For Jim, head of the Lambert Construction Co., can do all of these things with better than average skill. And he is something of a wizard in that all-important category of handling equipment.

Long years as an equipment operator and trouble shooter have given him a sort of sixth sense around machines—a sense that more than once has spelled the difference between money lost or money saved. For instance, there was the time when a couple of brand-new dirt-moving wagons arrived on one of his jobs. Jim watched them work for a while, then sat down and wrote the manufacturer warning him that the machines would fail shortly from a structural weakness. Furthermore he put his finger precisely on that weakness. Sure enough—the wagons broke down just as predicted. The manufacturer redesigned his product, and Jim got new machines to replace the ones in which he detected the flaw.

The big contractor—he is 6 feet 2 inches, weighs 200 pounds—got the feel of tools in his father's blacksmith shop in Hancock, Iowa, the town where Jim was born. Now nearing 50, he usually comes out on his projects in working clothes so he can speed the job along by doing part of it himself. With his knowledge of the capabilities of various machines, he has developed some interesting and unorthodox applications of equipment.

To cite a recent example. His superintendent was encountering great difficulty in driving steel I-beam guardrail posts into a tightly compacted fill made of gravel and glacial-till boulders. Jim wheeled out a wagon drill and opened holes at the proper locations using the largest-size bit available. Then with a specially built driving head placed on top of the posts, he drove the I-beams to grade with the wagon drill. He had tapered the bottoms of the posts to a rough point by cutting off the corners with a torch. This ingenious method of setting guard rail has already been successfully copied by one of the New England state highway departments.

Life in the Midwest

While Jim was still a small boy, his father felt that his fortune would be bettered if he got away from the blacksmith shop and farmed the rich, deep-black soil of Iowa. Accordingly the elder Lambert moved his family to Dunlap, Iowa, where Jim attended school and performed the multiple chores expected of a farmer's son. When World War I broke out Jim enlisted, though he was still too young to be drafted. After serving more than a year he returned home at the end of the war, and then moved westward with his family to Norfolk, Nebr.

He married there, at 21. Shortly after, he and his father bought a garage in Dell Rapids, S. Dak. During the three years they operated the garage, Jim acquired considerable knowledge of the maintenance and repair of trucks, passenger cars, and miscellaneous machinery. Then his father wanted to sell the business, so Jim looked around for another job.

In his early 20's, with a craving for adventure, the husky youth went to work for the Pinkerton Detective Agency, and was trained as a private investigator. Those were the days before the FBI or G-men came into ex-

(Continued on next page)

C. & E. M. Photo

Jim Lambert comes out on his Mendon Mountain grading project—as on most of his projects—in working clothes so he can speed the job along by doing part of it himself.

CR

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Equipment Experience Helpful to Contractor

(*Continued from preceding page*)

istence, and a goodly number of Jim's cases were quasi-Governmental in nature. He sleuthed through the southwest, and also covered jobs in Central America. After two years of roving assignments he was ready and anxious to settle down somewhere with his wife and his daughter, Jeanna Joan, who had been born in 1920. Having hung up the gum shoes, Jim bought a half interest in a Colorado sawmill.

Goes Into Business

"Full of youthful enthusiasm, I really expected to make a million", Lambert reflected. "We were cutting ties for the Denver & Rio Grande RR, and were getting paid $1.10 for each standard-gage tie. Things went fine for six weeks; then the mill caught fire and burned to the ground. My investment was wiped out, so I got a job with Pederson, Shirley & Gunther, of Omaha, Nebr., at that time one of the country's largest contracting firms.

"They were constructing 61 miles of railroad in Montana for the Northern Pacific RR, and had 5,000,000 yards of dirt to move. I started as a tractor operator. We used Holt and Best tractors in those days, and most of the dirt-moving was done with Stroud wagons. Three mules pulled one wagon. The big, cumbersome elevating grader that we had on the job took 16 mules to move. Besides running a tractor on that railroad project, I also operated a Thew shovel."

While on that lengthy contract, incidentally, Jim Lambert established a record for dirt output with a shovel. He later was converted into a "trouble shooter", and went from one end of the job to the other on repair work, also keeping the equipment of the subcontractors in working order.

"In nine cases out of ten, magnetos were the cause of equipment being laid up", Lambert recalled. "I got so I could spot the trouble and get the machine working in a short time. We had to keep those tractors and shovels working in all kinds of weather too. Finally on Thanksgiving Day in 1925 the temperature dropped to 22 degrees below zero, so the job shut down for the winter, and I went back to Omaha."

Equipment Expert

The following spring the Thew Shovel Co. started a school in Lorain, Ohio, for a few outstanding shovel operators picked from the ranks of a selected number of large contractors. Lambert was among those chosen, and he took the course with the blessing and approval of Shirley, his first contractor boss, who has continued to be a close friend.

On completing the course, Jim stayed on with the shovel company, traveling around the country as a service engineer, and later going on assignments into Canada, Mexico, and Cuba. He supervised setting up the larger crane and shovel units of which many in those days operated on rails instead of crawler treads.

"I remained there until 1930," Jim related, "during which time I think I visited every brick yard in the country, for shovels were used extensively in the brick-making industry. Finally after a stretch of 21 straight nights sleeping in Pullman cars, I decided for the second time to stop roving, and get a job where I could stay put for a while. B. Perini & Sons Co. of Framingham, Mass., was then constructing the Boston-Worcester Turnpike, and I got a position with the company as Superintendent of Equipment."

Lambert worked for the Perini organization until April, 1934, when he went into the contracting business with a partner who had been a shovel operator for Perini. The new combination of Lambert & George started on a small scale. First the two men bought a Lorain 75 shovel which they rented out, with themselves as operators. Their first job was on the Waterbury, Vt., dam being built as a Federal project, and for the use of the shovel with operator they were paid at the rate of $5.45 per hour.

Full-Fledged Contractor

"During that first construction season," said Lambert, "we worked the shovel 1,925 hours, and had a loss of only 15 minutes for repairs. The next year we bought another shovel and a couple of dozers and had them all working on either the Waterbury or the Wrightsville dam. A short time later we added a third shovel. All this work was located in Vermont, and we liked the state so much we decided to stay there.

"In 1936 we made our first bid for a highway contract and got the job—a 1½-mile grading project near Thetford, Vt. Our bid was around $26,000. Our next contract was over twice as big, and from then on we gradually worked up to larger projects."

Again the War

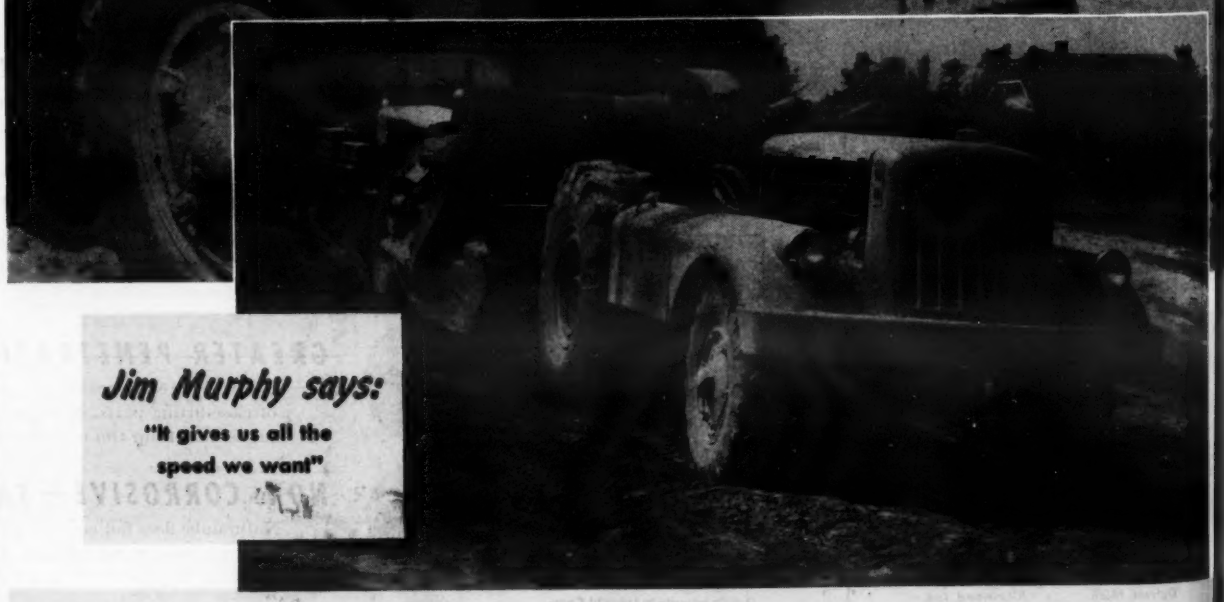
In 1941 when this country entered World War II, the firm of Lambert & George had $750,000 worth of work going on, and had reasonable prospects of doing a lot more in the way of emergency construction. But as fast as possible, Jim Lambert got his jobs cleaned up to a point where he could once again join the Army. Construction-engineer officers were badly needed—not theorists but "doers" who knew how to handle men and machines. Lambert was made a major, given six months of basic training at Camp Claiborne in Louisiana, and early in 1943 was sent to North Africa. In a short time he was promoted to a lieutenant colonel, and appointed Area Engineer for a 1,800-mile stretch along the Mediterranean in Algeria and French Morocco.

From Africa he jumped across to Sicily with the invasion, then into Italy, and later to the island of Corsica. In Corsica he became Chief Engineer of the district, and organized the engineering logistics for the invasion of southern France. Following the successful landing in France, he returned to Corsica, and remained in the Mediterranean sector until his return to this country in October, 1945.

He came back with three battle stars, the Legion of Merit, and a recommendation for the Bronze Star. He also had a record of construction achievement in such varied military and civil works as roads, bridges, airports, landing docks,

(*Concluded on next page*)

Another boost for



CATERPILLAR

REG. U. S. PAT. OFF.

C. & E. M. Photo
Lambert's chow, Ching, and Tabby, his kitten, don't seem to mind his ukulele playing a bit.

and even a sawmill, which brought back memories of his own ill-fated venture with a sawmill in Colorado.

The Road Back

The war over, Lambert returned to the contracting business in Vermont, but now heading his own company known as the Lambert Construction Co. His younger brother Darrell, also a skilled worker around equipment, is in with him. The company is currently engaged in constructing a new $275,000 road up the eastern slope of Mendon Mountain, part of Vermont's Green Mountain range.

Up there in the pine woods, Jim lives close to the job in a 3-room cabin with Ching, a year-old chow, and a kitten that he found crying in the woods. Jim feeds his pets as well as himself, and is rather proud of his ability as a cook. With great success he has trained Ching to let the kitten alone, and the attitude of the two natural enemies is changing from toleration almost to friendship.

Shortly after the war his marriage ended in divorce, and Lambert is now leading a bachelor's life again. Recently he took up flying, and pilots his Cessna 2-passenger plane around New England whenever he has the chance. Contractors do not usually have much spare time on their hands, and Jim Lambert is no exception. He does, however, take a deep interest in the problems of the construction industry, and is on the Board of Directors of the New England Road Builders Association.

A genial person, Lambert's favorite way of passing an evening is to get a bunch of friends together at his cabin for a few drinks and to sing some favorite old songs, while he plunks out an accompaniment on the ukulele or guitar. One of the contractor's proudest possessions is a recording machine on which he makes records of these impromptu song fests so that his friends can hear at once how good or how bad they really are.

During the autumn hunting season he usually gets away for a couple of weeks to a little hunting lodge he owns deep in the wild fastness of New Brunswick. "I can't hunt here in Vermont", he explained with a smile creeping around his light-blue eyes. "I have to go into Canada even though game may be plentiful in these Green Mountains. I live here in Vermont. This is my state, and I just couldn't shoot a deer which lived around in this country."

The transplanted Iowan has become a sentimental Yankee.

Zoned Equipment

The "Caterpillar" Diesel track-type Tractor for bulldozing and scraper loading, plus the "Caterpillar" Diesel wheel-type Tractor for fast work on the longer hauls. . . . There you have the key units of the *zoned equipment* set-up that's behind the enthusiastic comments of the head of James Murphy & Sons, Cleveland contractors.

Mr. Murphy has had long acquaintance with the fine performance and dependability of "Caterpillar" track-type Tractors, but he also finds that the more recently acquired DW10 (wheel type) is making equally fine records on the kind of work for which it is primarily designed.

Zoned equipment (assigning exactly the right type of unit to each division of an earthmoving project) has so many advantages for completing contracts more efficiently, quickly and profitably that contractors everywhere are re-balancing their equipment toward those ends. Let your "Caterpillar" dealer help you analyze your needs for the projects you've signed up or have in prospect.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

BUILDING PROJECT—In cutting down a corner for a gas station and using the spoil for fill on a chain-store construction job in another location, the DW10 Tractor and Scraper shown on the opposite page averaged 3½ minutes per round trip (load, carry, dump and return) on a 1000-ft. haul. Three D7 Tractors, a DW10 Tractor, a No. 70 Scraper, a No. 7S Bulldozer, and a D4600 Engine in shovel, make up the James Murphy & Sons' team of "Caterpillar" matched equipment.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

Drafting Specialties

A line of specialty drafting aids is made by the Stewart-Jackson Instrument Co., 815 Yale St., Los Angeles 12, Calif. These include the Flex-A-Beam circle-drawing aid, the S&J adjustable quadrangle aid, and the Vant Rule drafting scale.

The Flex-A-Beam compass is a vest-pocket-size device designed to draw ellipses, spirals, and circles up to 12 feet in diameter. It consists of a pencil holder attached to the end of a stretch-proof linen line. The line is rolled on an aluminum-encased reel. Pressing a release button permits the line to be drawn out to whatever radius is desired. When the button is released, the line is said to hold true to the desired length.

The S&J quadrangle is a plastic device for drawing grade slopes, percentage slopes, translating roof pitch into angles, etc. It has four scales: a 90-degree protractor calibrated in units of 30 minutes; a percentage-slope scale calibrated from 0 to 100 per cent, and giving the tangents of angles from 0 to 45 degrees; a sine scale calibrated for each 5 degrees from 0 to 90; and a pitch scale calibrated between 0 and 24 (full pitch).

The Vant Rule is a 13½-inch-long slotted transparent instrument with eight scales combined on one side. These scales are set to read directly calibrations of ⅛, ¼, ⅜, ½, ¾, 1, 1½, and 3 inches to the foot. Other scale models are also available.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 4.

Huber Marks Anniversaries

This year The Huber Mfg. Co. of Marion, Ohio, is marking three dates in its history—the 85th anniversary of its founding, the 40th anniversary of the introduction of the Huber steam roller, and the 25th anniversary of the company's automotive-type motor roller.

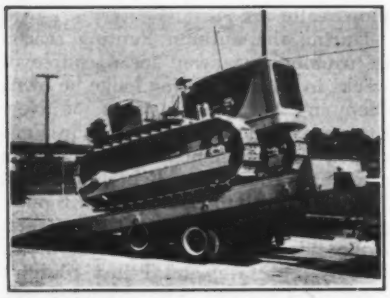
Huber now offers 3-wheel rollers in sizes from 5 to 12 tons, with heavy-duty 6-cylinder gasoline or diesel-engine power units; tandem rollers from 3 to 12 tons, with facilities for variable weight by water ballast; and the Huber road maintainer which, with attachments, may be used as a bulldozer, V-type snow plow, one-way snow plow, rotary ratan or steel broom, highway mower, patch roller, or lift loader.

Under-Road Boring Machine

A bulletin describing the features and operation of its under-road boring machine has been put out by the Young Engine Corp., Canton, Ohio. This bulletin, No. 15, shows a photograph of the machine in use, and tells of several projects on which it has been used.

The folder then lists eleven steps which cover the operation of the machine, how to set it up, the power units required, and miscellaneous data. Included in the folder is a list of the other machines built by the Young Engine Corp.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 71.



A Rehberger 12-ton Tip-Top trailer is shown here loaded with a Caterpilar D7. The platform will return to its original position as soon as a release valve is opened, and locked there automatically.

Tilting-Top Trailer In 7 and 12-Ton Size

Tilting-top trailers in 7 or 12-ton capacities are made by Arthur Rehberger & Son, Inc., 320 Ferry St., Newark 5, N. J. These trailers feature a hydraulically controlled hand-operated pump for raising and lowering the platform. They are equipped with approved lights and reflectors; vacuum, air, or electric brakes; and are said to conform to other state laws concerning accessories required for equipment of this kind.

In operation, the tail skid is lowered and the loading platform is raised by means of the hand pump. The equipment to be transported is then driven on to the trailer under its own power, with the tail skid serving as a ramp. Opening the release valve permits the platform to return to its original position where a special lock is provided which automatically holds the platform in place. The tail skid is then raised to shorten the overall vehicle length and also to act as a barrier for the load.

These trailers require no added ramps or jacks to assist in loading or unloading operations.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 3.

Metal-Protecting Paint

A recent development for protecting metal structures against weathering is described in a 12-page catalog issued by The Arco Co., 7301 Bessemer Ave., Cleveland 4, Ohio. This new product, Dum Dum for Metal, is applied by spraying. It is designed to provide a thick, tough, but elastic coating, weather-resistant and water-repellent.

It can be used on both new or uncoated metal, or over previously painted surfaces. The manufacturer states that though the outer surface sets hard, the undersurface remains pliable and elastic. And, should the hard outer surface be bruised or broken, the pliable undersurface hardens where exposed—thereby healing itself.

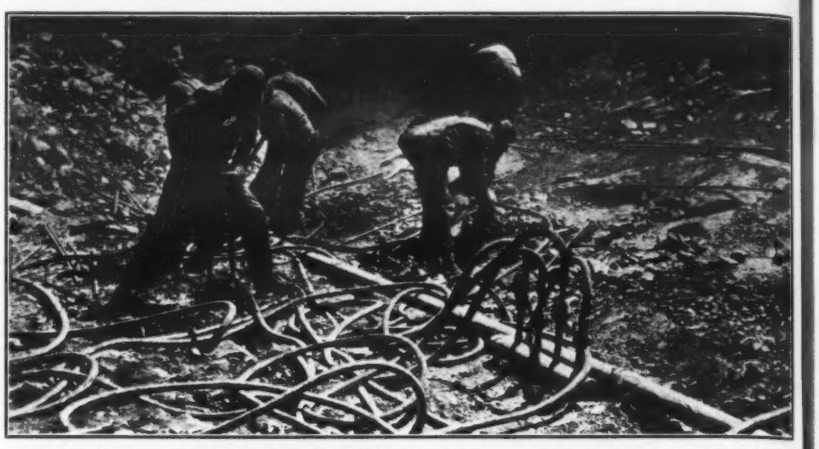
The catalog describes the development and features of Dum Dum, and gives several typical applications. It tells how to use this material when painting previously coated metal surfaces, new or uncoated metal surfaces, bituminous-type coated metal surfaces, etc.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 53.

New Air-Hose Cover

The development of a new type of cover for its Redwing air hose has been announced by the Goodyear Tire & Rubber Co., Akron, Ohio. It uses a cushioning stock similar to one developed by Goodyear for tire treads. The softness of this heavy-gage stock is said to afford maximum resistance to abrasion and gouging.

The hose is reinforced with a cabled-cotton body to bring about greater carcass strength and flexibility. The seamless tube is unaffected by lubricants, the manufacturer states, and is not subject to swelling and flaking brought about by these substances. The Redwing air hose is made in two types—two-braid standard for pneumatic-tool service, and three-braid heavy-duty for air-drill use. Hoses range in size from ⅜ to 1½ inches in diameter; and are supplied in lengths of from 25 to 50 feet, or on 450-foot reels.

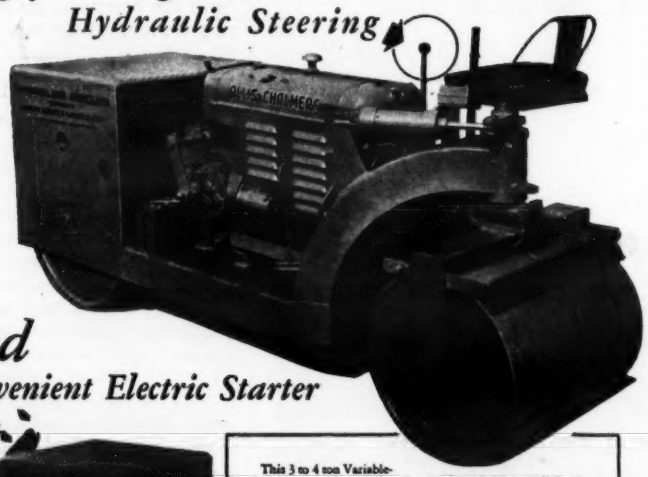


Goodyear's new "cushioning" cover for its Redwing air hose undergoes a rugged test at Granby Dam, part of the Colorado-Big Thompson project. The hose cover is designed to afford maximum resistance to abrasion and gouging.

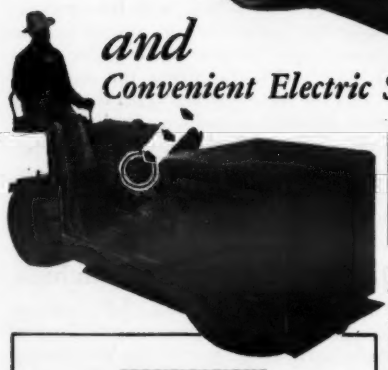
Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 28.

WHEELER Tandem Rollers

Bring you Single-Lever Hydraulic Steering



and Convenient Electric Starter



This 3 to 4 ton Variable-Weight roller is popular *on the job*. Its convenient features include the single-lever clutch, the foot operated parking brake and easier maneuverability.

Wheeler Tandem Roller's single lever, hydraulic steering and electric starter can improve your on the job efficiency. The Hydraulic steering is engine powered. Operating by finger tip control, the steering knob moves to right or left, leaving the operator free to devote full attention to the rolling job at hand. Turning and maneuvering is greatly simplified; the square footage rolled per day can be increased. This single steering knob is the only control needed to slowly or quickly turn a Wheeler Roller in any direction. Convenience means faster operation.

ELECTRIC STARTER AIDS OPERATION

The electric starter, now offered with the Wheeler Roller, simplifies starting and stopping. Idle running time is reduced and waste of fuel is minimized. Well within the operator's reach, the starter reduces the operator's labor and operating time.

NEW DEALERS are being added—Choice territories are still available

SPECIFICATIONS

POWER: Allis-Chalmers Industrial-Model B. 24.5 Brake Horsepower @ 1500 RPM; 27.8 Brake Horsepower @ 1800 RPM. 5speeds 2 forward and 2 reverse give 1.55 to 4 MPH range in either direction.

DIMENSIONS: Wheel Base 7' 10"; length overall 10' 7"; width overall 3' 6". Tank height 4' 10". Ground clearance 10" Left side clearance 1½".

WEIGHTS: Shipping weight (approximately) 5500 lbs. Maximum weight (with ballast) 8000 lbs. Extra metal weight 400 lbs.

COMPRESSION Per Lineal Inch: Compaction roller, 150 lbs. with ballast. Steering roller 70 lbs. with ballast.

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Write for new 6-page folder.

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Division SHAW SALES & SERVICE CO.

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Convention Calendar

March 23-25—Ohio Highway Conference

Highway Engineering Conference and Road Show, Ohio State University, Columbus, Ohio. Professor Emmett H. Karrer, Chairman, Conference Committee, Department of Civil Engineering, Ohio State University, Columbus 10, Ohio.

April 7-8—ASCE Meeting

Spring meeting, American Society of Civil Engineers, William Penn Hotel, Pittsburgh, Pa. Col. William N. Carey, Executive Secretary, 33 W. 39th St., New York 18, N. Y.

April 13-16—N. Y. Safety Convention

Annual convention and exposition, Greater New York Safety Council, Hotel Pennsylvania, New York City. Edward A. Fullarton, Chairman, 60 E. 42 St., New York 17, N. Y.

June 21-25—ASTM Meeting

Annual meeting and exhibit of testing apparatus and related equipment, American Society for Testing Materials, Book-Cadillac Hotel, Detroit, Mich. C. L. Warwick, Executive Secretary, 1916 Race St., Philadelphia 3, Pa.

July 16-24—ARBA Road Show

Road Show, American Road Builders' Association, Soldier Field, Chicago, Ill. Charles M. Upham, Engineer-Director, International Bldg., Washington 4, D. C.

California Equipment Men Elect Officers for 1948

The Equipment Distributors and Manufacturers of Southern California has announced the results of its election of officers for 1948. Beal Shaw, Shaw Sales & Service Co., has been elected President. First Vice President is M. R. Dinsmore of Dinsmore Equipment Co. Second Vice President is Alex Kostyzak of the Smith - Booth - Usher Co. And Bert Koetters, of M. P. McCaffrey, Inc., will serve as Secretary-Treasurer.

The three directors elected are: Daley Bevis, Bevis Machinery Co.; John Carroll, of Harron, Rickard & McCone; and Paul Merritt, Essick Machinery Co.

This association is made up of thirty-three distributors and manufacturers of construction equipment. Its purpose is to serve the construction industry throughout Southern California, and to cooperate with contractors in making available sufficient equipment for the large program in 1948.

Vacuum-Processed Concrete

Descriptive literature on its method of processing concrete can be secured from Vacuum Concrete, Inc., 4210 Sansom St., Philadelphia 4, Pa. Vacuum-processing consists of removing excess water from freshly laid concrete by means of suction mats, to permit contractors to use high-water ratios during pouring, and yet secure concrete of a no-slump consistency.

To describe the process and the equipment required, the company has prepared a 16-page catalog which gives complete information. It tells what the method is, how it is used, the advantages claimed for it, and other relevant data. Engineering details are included on the strength, durability, and elasticity of concrete processed this way. The catalog also covers the use of this method in precast concrete construction.

Another catalog which tells the story of the precast vacuum concrete method in pictures is also ready for distribution at this time. It reports several typical jobs on which the method was used, and presents a complete pictorial record of what occurred. It shows the work in various stages of construction, lists the job details and specifications, and shows pictures of the completed construction.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 77.

Welding-Torch Head For Many Tip Sizes

Two new oxyacetylene welding torches have been made available by the Air Reduction Sales Co., Dept. 1046, 60 E. 42nd St., New York 17, N. Y. Features claimed for the Series 800—and its smaller companion, the No. 700—include better flame control, low maintenance costs, and modern design. It is 11½ inches long and weighs 1½ pounds. It is designed to operate single-flame welding tips from Nos. 0 to 13 inclusive, as well as multi-flame tips up to No. 15. The manufacturer recommends it for use in welding metals from thin sheets up to 1½ inches in thickness.

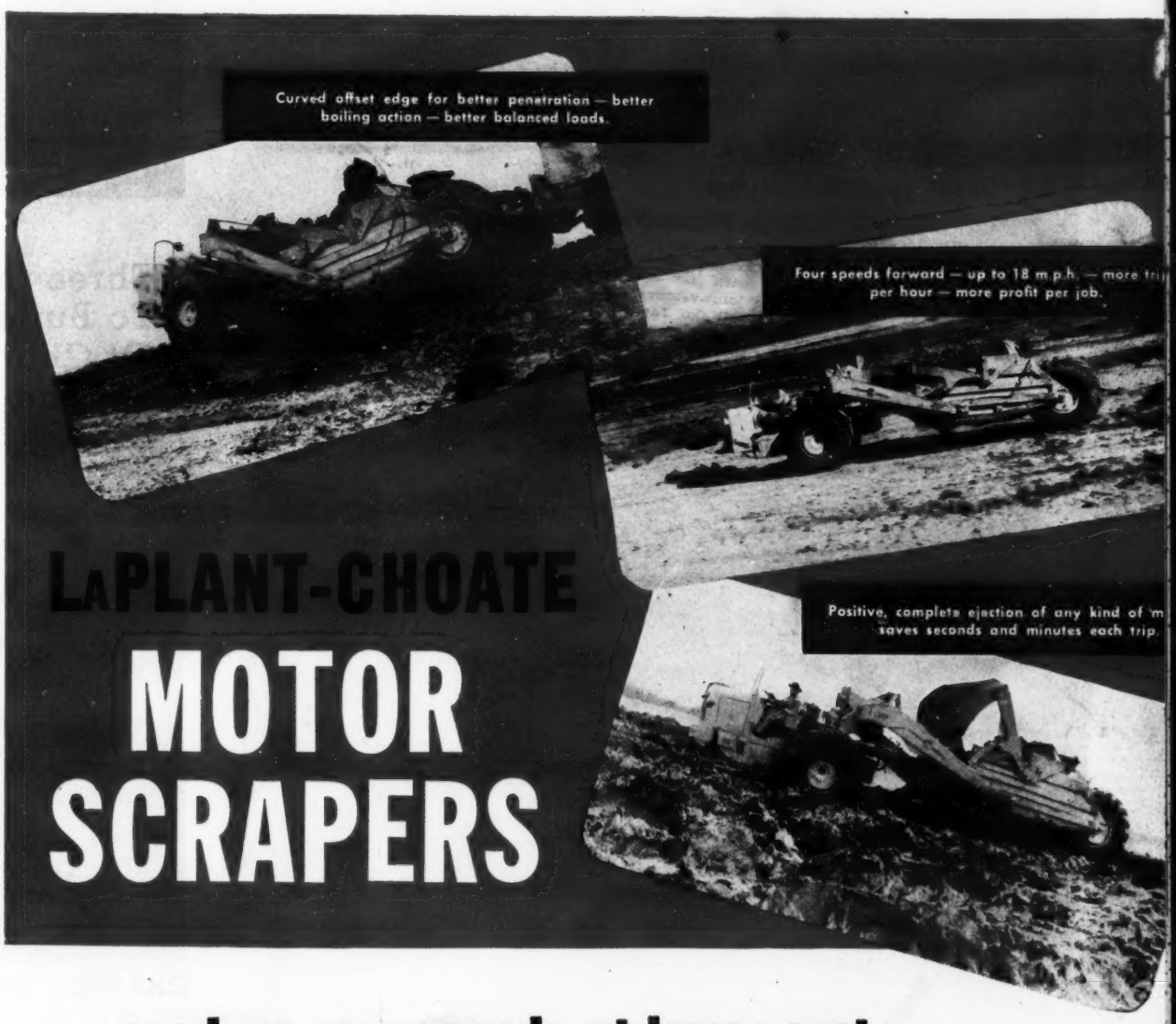
Each welding tip is assembled with an individual mixer drilled for that particular size of tip, to assure better flame control. Complete welding-tip assemblies are available in sizes 0 to 10 only. The torch head is made of Monel metal. This means fewer torch-head replacements, the manufacturer says, and lower maintenance costs, as re-seating is rarely required.

The smaller Model No. 700 is constructed along the same lines as the larger unit, and claims the same advantages and features—including the complete welding-tip assemblies in sizes 0 through 10. The 700 also uses standard Airco welding tips, styles Nos. 98 and 188, in sizes 00 through 10. Cutting attachments that use Airco's present line of cutting tips are available for these new torches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 41.

Roebling Names Hartmann

The appointment of E. George Hartmann as General Sales Manager has been announced by John A. Roebling's Sons Co., Trenton, N. J. Mr. Hartmann has been with Roebling since 1940. He is a member of the Wire Association and the American Iron & Steel Institute.


Curved offset edge for better penetration — better boiling action — better balanced loads.
Four speeds forward — up to 18 m.p.h. — more tri per hour — more profit per job.
Positive, complete ejection of any kind of m saves seconds and minutes each trip.
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With an absolute minimum of working parts, easy, trouble-free operation and maintenance assures a unit that will work hour after hour without costly down-time.

Simplicity of controls means easy operation. Double-acting hydraulic steering assures safe, positive steering with 60° turns each way without danger of jackknifing.

Improved, air-actuated LPC power control unit operates scraper with peak efficiency. Sixteen horsepower per struck yard of capacity for "plenty of power," up and down grade, in any material.

The scraper units are modern LPC scrapers which have been proved, by competitive test, to be the easiest loading, fastest spreading scrapers on the market!

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Concrete Flood-Control Channel

GROUND WATER. Moving in for a better look, we find the channel excavation bleeding ground water everywhere. Along with clay and silt, this was the chief problem faced by the joint-venture contractors—United Concrete Pipe Corp.; Vinnell Co., Inc.; and Ralph A. Bell. In the top photo, a 5-yard International truck end-dumps select pervious sand to replace the watery foundation and cushion the invert slab. In the bottom photo, workers fight water ahead of the wall-footing crew.

INVERT SLABS. Once the low-water channel was placing was divided among three handled wall footings, one the walls, and one the invert slab invert crew gets ready to move its machines—Koehring paver, Jaeger spreader, and Jaeger-Lakewood finisher—to a The spreader and finisher were widened to work a 40-inch slab wide. Inside channel width between walls is generally 1

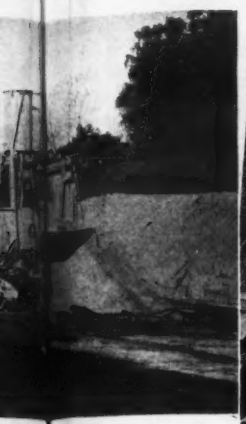
Three Contractors Join Forces To Build New Section Of Channel Along Dangerous River For the U. S. Engineers

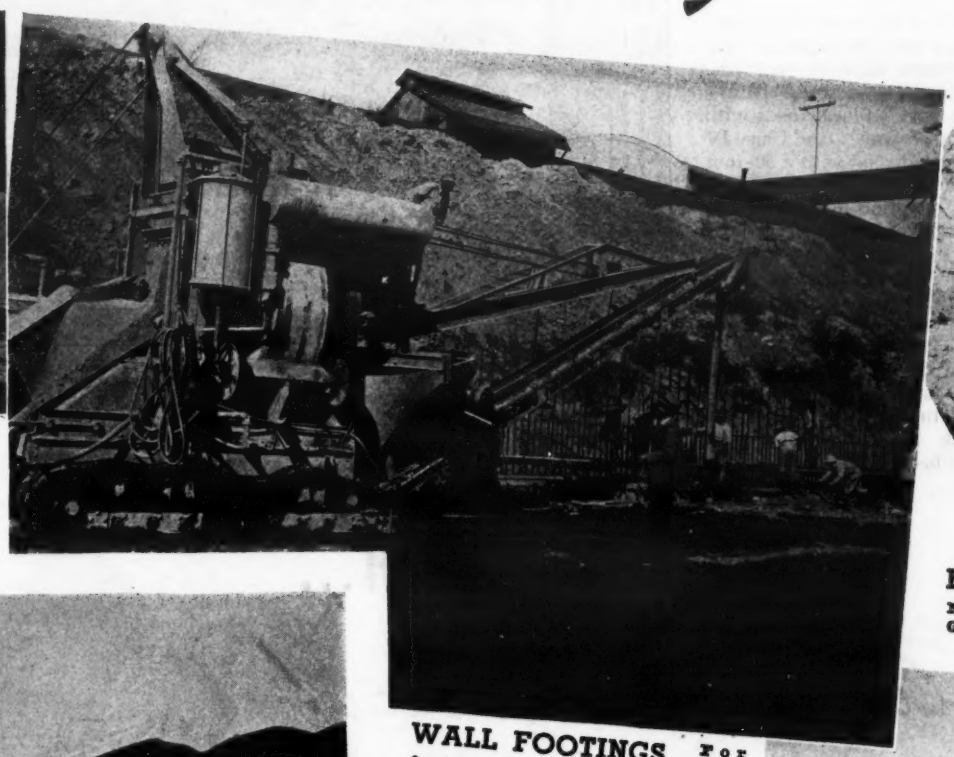
CHANNEL DESIGN. Another 9,000-foot section of concrete channel to protect Los Angeles from the unruly Los Angeles River has been built for the Corps of Engineers. Here's an overall view of the job. In the center of the main channel, between the Lima 1201 dragline excavating the left half and the invert already paved on the right half, is the 12-foot low-water channel. At the right, wall steel and heavy wall footings are in place.

WALLS. For the 18-foot-high wall pours, concrete was mixed in 1½-cubic-yard batches, dumped from a MultiFoote 34-E mixing drum to a transfer bucket, then hoisted by this self-propelled rubber-mounted Link-Belt Speeder crane to the hopper at the top of the pour.

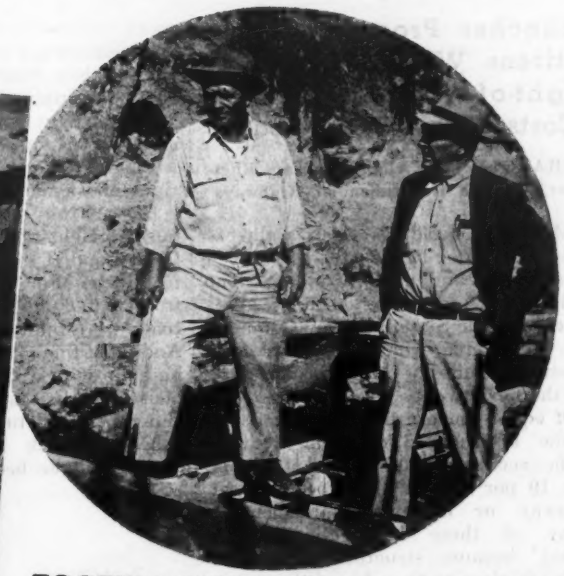
WALL FORMS. Through an intricate pattern of wall steel reinforcement, we see workmen preparing a steel wall form before it is set in place. Six sets of forms were built, in panels 50 feet long. And six big steamboat ratchets fastened from cleats in the wall footing to the back form held it true to line, with tie bolts holding the front form in place.

nel Is Extended by 9,000 Feet

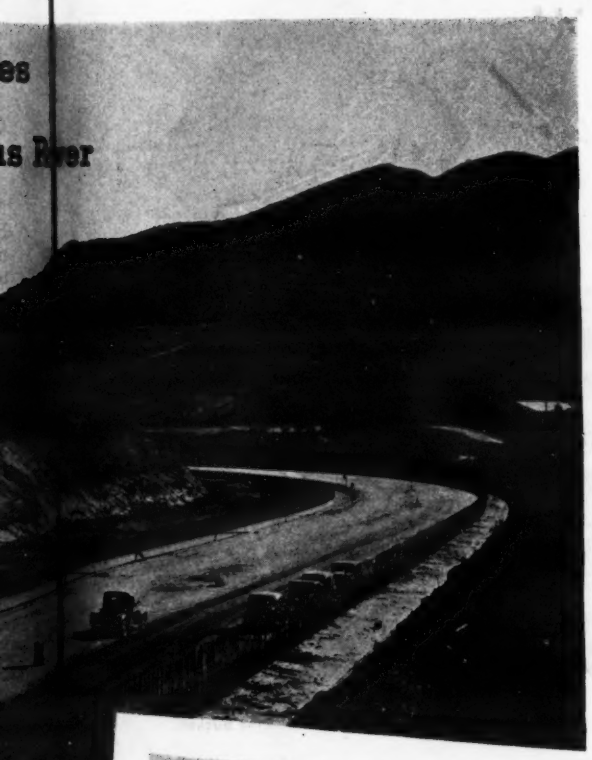




water channel was in, concrete vided along three crews. One one the invert slabs. Here the chines—Koehring Twinbatch wood finisher—to a new set-up. e work a 24-inch slab 28½ feet walls is generally 130 feet.



FOOTING SUPERVISORS. Wall Footing Foreman Arthur Nelson, left, and Corps of Engineers Inspector Herbert Gray were among the supervisory personnel responsible for speed and good work in the field.



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WALL FOOTINGS. For footing pours, this 24-inch-wide conveyor (picture above) was fastened to the boom of a MultiFoote 34-E paver, with the lower end under the paver bucket. It was driven by a 4-cylinder Le Roi gasoline engine, connected by a drive shaft to driving gears at the top of the 40-foot run. The paver bucket acted as a feeder hopper over the belt, which raised the concrete over the high wall reinforcing bars and fed it through an elephant trunk (photo at right) to the 40-cubic-yard footings. Forms were built of 2-inch shoring on 5-foot centers. A footing was poured in an average time of 1.25 hours with this equipment.

(C. & E. M. Photos)

(See article on page 81)

FORM STRIPPING. The big steel forms, weighing 14 tons each, were stripped 48 hours after each pour by a Manitowoc Speedcrane and walked ahead.

PERSONNEL. Here are some of the key field men who made this job tick. From left to right are United Concrete Pipe Corp.'s Vice President T. P. Polich; Project Manager and General Superintendent Roy Chinnici; Corps of Engineers Resident Engineer J. G. Morgan; and the contractors' chief estimator, A. T. Norwood. Total cost of the project was $2,800,000.

State Puts Highway Zoning Up to Public

Launches Program to Tell Citizens Why Zoning Cuts Right-of-Way Acquisition Costs, Means More Roads

By HAROLD J. NEALE, Landscape Engineer, Virginia Department of Highways

✦ MOVING buildings from right-of-ways is a major item in the cost of reconstructing and modernizing existent highways. And it has been of great concern to the State Highway Commission of Virginia, which plans to reconstruct 8,808 miles of primary roads during the next twenty years.

Of equal concern to the Commission is the 1945 record of rural-highway traffic accidents—10,929—and the fact that 19 per cent of them occurred at highway or driveway intersections. Many of these intersections were "blind" because structures had been built too close to the edge of the pavement to permit clear vision. And indiscriminate access to highways by patrons of roadside commercial establishments caused much of the loss of life.

Protective highway zoning ordinances which provide, among other things, adequate building set-backs, can materially lessen highway accidents and highway costs. Accordingly, legislation which authorizes such ordinances has been passed by the Virginia General Assembly; Governor William M. Tuck has endorsed a state-wide campaign to bring the urgency of the problem before citizens and local governmental units; and the Department of Highways and the State Planning Board have named a joint committee to carry out this directive.

Twenty-Year Plan

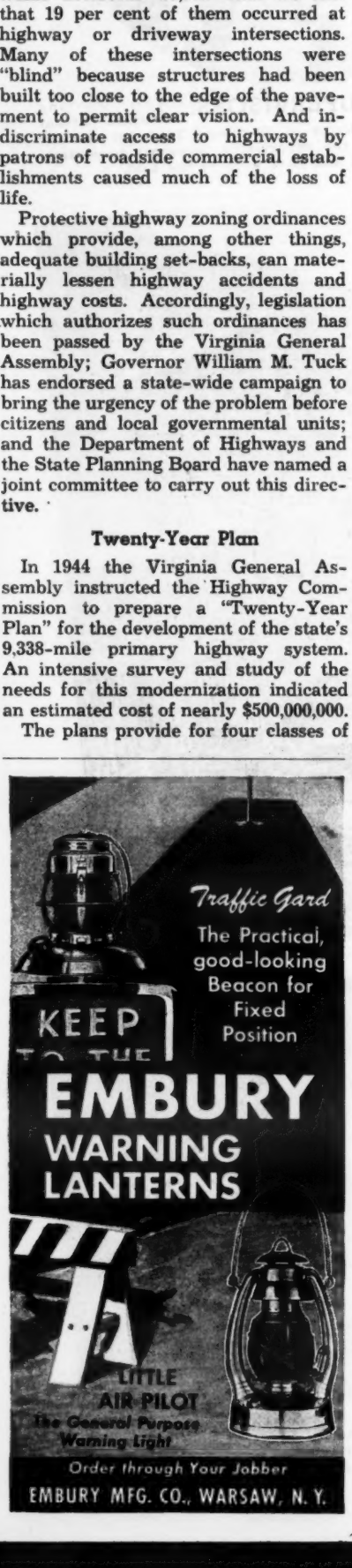
In 1944 the Virginia General Assembly instructed the Highway Commission to prepare a "Twenty-Year Plan" for the development of the state's 9,338-mile primary highway system. An intensive survey and study of the needs for this modernization indicated an estimated cost of nearly $500,000,000.

The plans provide for four classes of roads. Class I is a 4-lane divided highway requiring a 160-foot right-of-way. Class II is a 2-lane highway requiring a 110-foot right-of-way. Class III involves heavily traveled local roads with an 80-foot right-of-way. And Class IV is a lightly traveled road with a 50-foot right-of-way.

Before the adoption of this plan, normal right-of-ways in Virginia for Class I and II roads were from 60 to 80 feet wide. For other roads they were from 30 to 60 feet wide. Many of these roads were built a decade or more ago. And all of them have, naturally, become built up with a ribbon development of houses, stores, garages, filling stations, and other structures. With no established set-back line, most of these buildings have been built close to the edge of the present right-of-way. Consequently, they will be within the future right-of-way line.

(*Continued on next page*)

Pictorial exhibits are part of Virginia's campaign to let its citizens know what highway zoning means to them. Since this picture was taken, the style of the exhibits has been changed. They are now in panels for easy transportation to small local meetings.



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The Oliver "70", a streamlined industrial tractor with modern engineering throughout, together with the Ware Front End Loader attachment, is fast becoming a familiar sight around construction jobs that *move.* It's a tough unit that bites into the high cost of such jobs as hauling, loading, ditching, filling in, or removing snow . . . plus performing a score of other tasks.

Then, too, the Oliver Industrial "70" with the Ware Loader is compact . . . well balanced . . . low to the ground so that it can operate in tight quarters. It makes handling gravel, cinders, loam or other loose material a pushover. Here's a unit that will load up to 8½ feet . . . dump at any height. Substitute a blade for the bucket and you have one of the huskiest, easiest-to-get-around backfillers you've ever seen in operation.

You "go longer" per gallon of fuel because the "70" with the Ware Loader is equipped with the 6-cylinder "Fuel Miser" engine. Drop in at your Oliver Industrial Distributor. Learn firsthand about the many new engineering features that will help you *hit a new high in lower loading costs!*

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[illegible] the bucket and [illegible] working [illegible]

The OLIVER Corporation

INDUSTRIAL DIVISION: 19300 EUCLID AVENUE, CLEVELAND 17, OHIO

Cost of Moving Structures

For the 8,808 miles of reconstruction in its 20-year plan, it is estimated that Virginia will have to spend over $26,000,000 for moving right-of-way structures alone!

This figure is based on a study of 178 miles of reconstruction projects, which were built during the past seven years in different sections of the state and under varying conditions. It revealed an expenditure of $528,666 for moving, purchasing, or rebuilding structures. This is an average of $2,970 per mile. Multiply 8,808 miles by $2,970 a mile, and you have the staggering figure of over $26,000,000.

Another study in Fauquier County indicates that 240 buildings will have to be moved from the proposed right-of-ways at an estimated cost of $600,000 before a mile of new pavement can be laid. Within a 10-mile radius of Richmond, proposed highway development will make it necessary to move some 140 stores and other buildings, and some 70 filling stations. The cost, before a mile of new road can be constructed, will be about $500,000.

Moreover, as each new building goes up along some highway, the total figure is increasing. To learn how much it is increasing, a 35-mile section of Route 29 in Albermarle County was selected as typical of the highways in rural areas which are scheduled for widening in the 20-year plan. A field check showed that sixteen new buildings had been constructed on the necessary right-of-way since 1940. The cost of moving these sixteen as a preliminary to widening will be about $35,000.

In short, it has been estimated that normal growth of urban and rural areas in Virginia will involve an overall cost of more than $26,000,000 for the moving of structures that will be built from now on—not including existing structures—before the 20-year modernization plan can be completed.

Cost to Private Interest, Too

Not only is the State interested in conserving its dollars for actual highway construction; it is also looking to the protection of private interests.

For example: a person may build a comfortable house on a highway in a rural area. He may grade the lawn, plant shade and fruit trees, and embellish the grounds with shrubbery. Each year the trees and shrubs develop and flourish. Then plans are perfected for reconstructing the highway, and the landowner is bought out and ordered to move.

Moving his house is not only an inconvenience to the tenant. It may represent a huge loss. For it is not always possible to re-establish landscape effects at once, and where fruit trees are involved, the dram on his pocket is even more evident.

In another case, a man establishes a rural store and filling station. Then he is ordered to move. During the moving process, his gas pumps are out of service for a time. Customers find another dealer nearby. And the first man has to promote a new trade when his facilities are again made available. He is the loser in many ways.

Zoning Is the Answer

It is evident that some measure must be taken to relieve the Commonwealth of all these unnecessary costs—the cost in life from accidents in "blind" rural highways; the cost to private citizens of having their homes or places of business moved; and the cost to the state of spending highway-building dollars to remove structures from right-of-ways.

Accordingly, the State Highway Commission and the State Planning Board have appointed a joint committee to make an intensive study of existing zoning legislation, and to effect procedures with which to put these laws into more complete operation.

Zoning is not a new feature in the Old Dominion State, for the General Assembly of 1926 passed an act permitting municipalities to undertake zoning. The following year, the county zoning act was passed. And in the years after that, zoning legislation was fortified and changed until the current county zoning act was passed in 1938.

County Attitude Towards Zoning

There was also an act which established a State Planning Board. Among the board's other duties is this one: "To advise with the various state departments, bureaus, and institutions with a view to the coordination of all development plans that are related to an orderly and comprehensive development of the state." However, the actual practice of instituting, planning, and zoning has been left to local authorities—the Board of Supervisors of each of the 100 counties. And the State Planning Board has taken the position that until county authorities initiate planning and a demand for zoning studies, it is not at liberty to promote public interest of any community towards that end.

In 1944 the General Assembly passed a Regional Planning Act. And in 1946 it passed the Land Subdivision Act, which gives counties the authority to pass ordinances regulating subdivisions within the county. Moreover, for any subdivision within a 5-mile radius of any city with a population over 100,000, it provides for joint city-county control; so also for subdivisions within a 3-mile radius of a city of under 100,000, and for those within a 2-mile radius of a town.

At the present time, 49 counties, 16 cities, 26 towns, and 1 region have planning commissions. But of this number, only 10 counties, 14 cities, and 15 towns have passed zoning ordinances. All of this indicates that the majority of the people, especially in rural areas, are not

(*Concluded on next page*)

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State Puts Highway Zoning Up to Public

(*Continued from preceding page*)

interested in zoning measures or anything that restricts the use of their lands. And the political heads of these counties are naturally governed by the dictates of their constituents.

However, many of these county supervisors are becoming interested in the plea of the State Highway Commission for definite assistance. Aware that millions of dollars are involved in the development and modernization of the highway system, and informed that highway zoning can avert unnecessary highway costs, they accept their responsibility as heads of local government for protecting the State's interest.

Appeal to the Public

The joint committee which was named to study zoning legislation and put it into more complete operation is composed of five engineers from the Highway Department and four members of the State Planning Board. One engineer from each of these departments acts as liaison between the committee and the county authorities.

This committee is in the process of explaining to county officials how much it will cost, under present conditions, to develop the road system within their county. It is showing them how much more the roads will cost and how much longer they will take to build unless some measures are devised to see that all buildings constructed hereafter are placed well back of the ultimate right-of-way line.

"In plain terms . . . either the counties must settle for proportionately fewer new and improved highways or must resign themselves to doing without necessary highways for a proportionately longer time; that is, unless local governing bodies will assume the responsibility of doing something about it!" This statement of alternatives is quoted from a short folder which the committee has prepared called "Dollars and Sense". It explains simply to citizens what Virginia's 20-year plan entails in the way of highway reconstruction, what the work itself will cost, and above all what moving right-of-way structures will cost unless zoning measures are taken. It tells citizens how *they* can help, and it carries a letter of endorsement from His Excellency, Governor William M. Tuck.

The committee has also prepared a "Suggested Outline for a Highway Zoning Ordinance for Virginia Counties". This stresses highway zoning for building set-backs and, at the same time, calls attention to the more comprehensive types of zoning. It recommends lines of control 300 feet from the center line of primary road right-of-ways, and 200 feet from the center line of secondary road right-of-ways. It provides a model for phrasing a highway zoning ordinance, section by section: title and ordinance number, statement of purpose and ordaining clause, establishment of districts, general provisions, enforcement, provisions for appeal and amendment, and interpretation provisions. The assistance of the members of the committee is offered to county officials in effecting such an ordinance.

Public meetings are being held in various parts of the state. During them, the circular "Dollars and Sense" is distributed and the value of zoning to the locality and to property owners is carefully explained. Pictorial exhibits are also shown at the meetings. They cover the work entailed in moving buildings for right-of-way acquisition. And they stress the safety, utility, beauty, and economy of highway zoning. Moving pictures and slides are also being prepared for this educational program.

Public interest has already been aroused by the work of the committee. County officials, civic organizations, garden clubs, as well as individual property owners are already responding to the call to protect Virginia's highway funds so that the state highway system may be modernized economically and efficiently within the 20-year period.

Allied Expands Warehouse

Construction of an addition to its warehouse facilities has been started by Allied Steel Products, Inc., Cleveland, Ohio. This company manufactures Mango manganese-steel bars for shovel teeth and the Grip-Lug for repair of tractor grousers.

Extension-Cord Reel

A specially built carrying reel that holds up to 400 feet of electrical cord is manufactured by the Industrial Electrical Works, Dept. 134, 1509 Chicago St., Omaha 2, Nebr. The Port-O-Reel is designed to carry long lengths of cord with short-cord ease. Weight of the reel minus cord is less than 15 pounds.

A cord guide is set near the base to prevent kinks and simple knots when rewinding, and to help prevent tipping. An adjustable brake and lock provides friction to control the rotation of the reel. Current is transmitted through a heavy, double-constant contact-collector ring built into the reel. The Port-O-Reel can be supplied with a hand lamp with guard, switch, and industrial-type receptacle for use with power tools. A 15-foot feeder cord or a plug-in receptacle built into the main frame are optional features.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 37.

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All Purpose SHOVEL

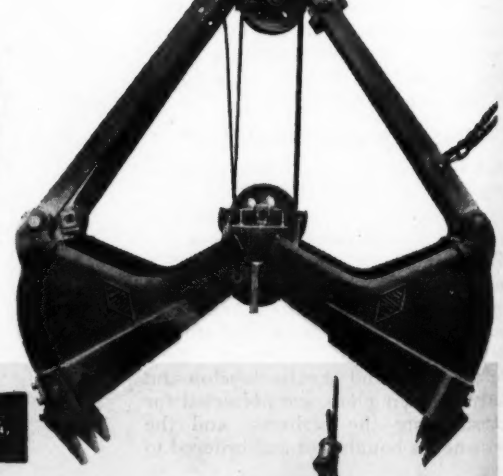
PULLSHOVEL • DRAGLINE

CLAMSHELL

FRONTS, BOTTOMS, SCOOPS and TEETH shown in yellow on buckets are 14% manganese steel developing tensile strength up to 120,000 p.s.i. This high-percentage manganese steel gives tough, rugged strength for hard service and allows wide set corner teeth for easy entrance in digging. Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

Experience Counts. See your shovel man or equipment dealer about PMCO Buckets and Dippers.

On the ½ yd. and ¾ yd. Shovel, Pullshovel and Dragline Buckets, all teeth are interchangeable—a great advantage to operators.



Clamshell
Sizes ⅜, ½, ⅝, ¾, 1 yd

Pullshovel
Outside Cutter Widths
21", 26", 31", 36", 39"

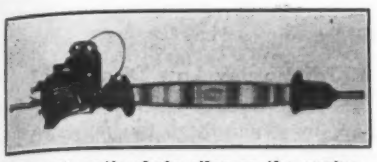
Shovel
Sizes ⅜ to 18 yds.

Dragline
Perforated Sizes ⅜ yd. to 2 yds.
20%-40% lighter than other makes
Solid sizes ¾ yd. to 2 yds.
Mine Stripping Sizes 2yds. to 9 yds.

"Quality Since 1880"

PETTIBONE MULLIKEN CORP. CHICAGO 51, U. S. A.

WE OPERATE THE LARGEST AND MOST COMPLETE MANGANESE STEEL FOUNDRY IN THE UNITED STATES



An automatic chain oiler on the engine and a simplified tailstock have been added to the Disston chain saw.

Two Features Added To Chain-Saw Design

Two new features in the engine and tailstock assemblies of its chain saws are announced by Henry Disston & Sons., Inc., Philadelphia 35, Pa. They are an automatic chain lubricator and a simplified cradle-balanced tailstock.

The chain lubricator on the engine has been designed to make the volume of oil supplied to the chain entirely automatic and of enough pressure to prevent clogging of the line by sawdust and other foreign matter. The pump is said to operate in any position, and to shut off the flow automatically when the chain is not running.

The manufacturer points out that the new pump is cam-operated and develops positive pressure with each turn of the sprocket. The capacity of the oil reservoir matches that of the fuel tank, so that under ordinary operating conditions, the supply of chain-lubricating oil will last as long as a tank of fuel for the engine. Any type of oil, as well as kerosene, may be used as a chain lubricant. Oil lines are protected against damage, and disengaging the clutch automatically shuts off the flow of oil, Disston Co. says. The new unit is fully interchangeable with equipment now in use.

The tailstock has been redesigned and made smaller for easier handling. The cradle-balance feature means that it is shaped to fit into the operator's arm so he can use the body of the tailstock as a fulcrum for maneuvering the saw in the cut. This new design is said to provide a higher degree of safety by making the tailstock detachable, and by eliminating slots which expose the operator's fingers to the cutting chain.

Moreover, a new device is provided for altering the tension of the chain through a wide range to suit the individual requirements of the job. And an additional abutment plate on the tailstock is said to make the saw more efficient in inverted bucking.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 42.

Lightweight Engine

A lightweight vertical-shaft gasoline engine is announced by the Power Products Corp., Grafton, Wis. It weighs 16 pounds and delivers 1 hp. The manufacturer recommends it for use with most rotary-type equipment requiring an engine of this size—compressors, generators, pumps, etc.

Its 2-stroke principle and the use of lightweight metals in its manufacture are cited as features of the engine. The unit is designed to give good operation at any tilt up to 45 degrees. It is 8½ x 10½ x 14 inches in size.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 9.

Cement Co. Appointments

Auwell Fogarty has been appointed Assistant to the Vice President, Western Region, of the Universal Atlas Cement Co., New York City—a subsidiary of the United States Steel Corp. Melvin L. Kurtz has been named Assistant Sales Manager of the metropolitan Chicago territory.

Thomas E. Bertelsen has been appointed a District Sales Manager. Mr. Bertelsen will cover the Indiana-Michigan District. He succeeds Theodore R. Prell, deceased.

Hoists for Many Purposes Described in New Catalog

A line of light, medium, and heavy-duty hoists is described in a catalog being distributed by the Domestic Engine & Pump Co., Shippensburg, Pa. These hoists are made in single or double-drum models with gasoline or electric power units. On the heavy-duty hoists, the power source is a 4 or 6-cylinder 4-cycle gasoline engine; on the medium-duty, a 4-cylinder 4-cycle gasoline engine; and on the light-duty, either a 7 to 12-hp gasoline engine or a 1,200-rpm electric motor.

Bulletin No. 47-H describes each of these models and gives its complete specifications and dimensions. The various features of the engines, gearing, speed control, mounting, clutch control, thrust apparatus, drums, winches, power transmission, brakes are thoroughly described. There is a picture of each style of hoist.

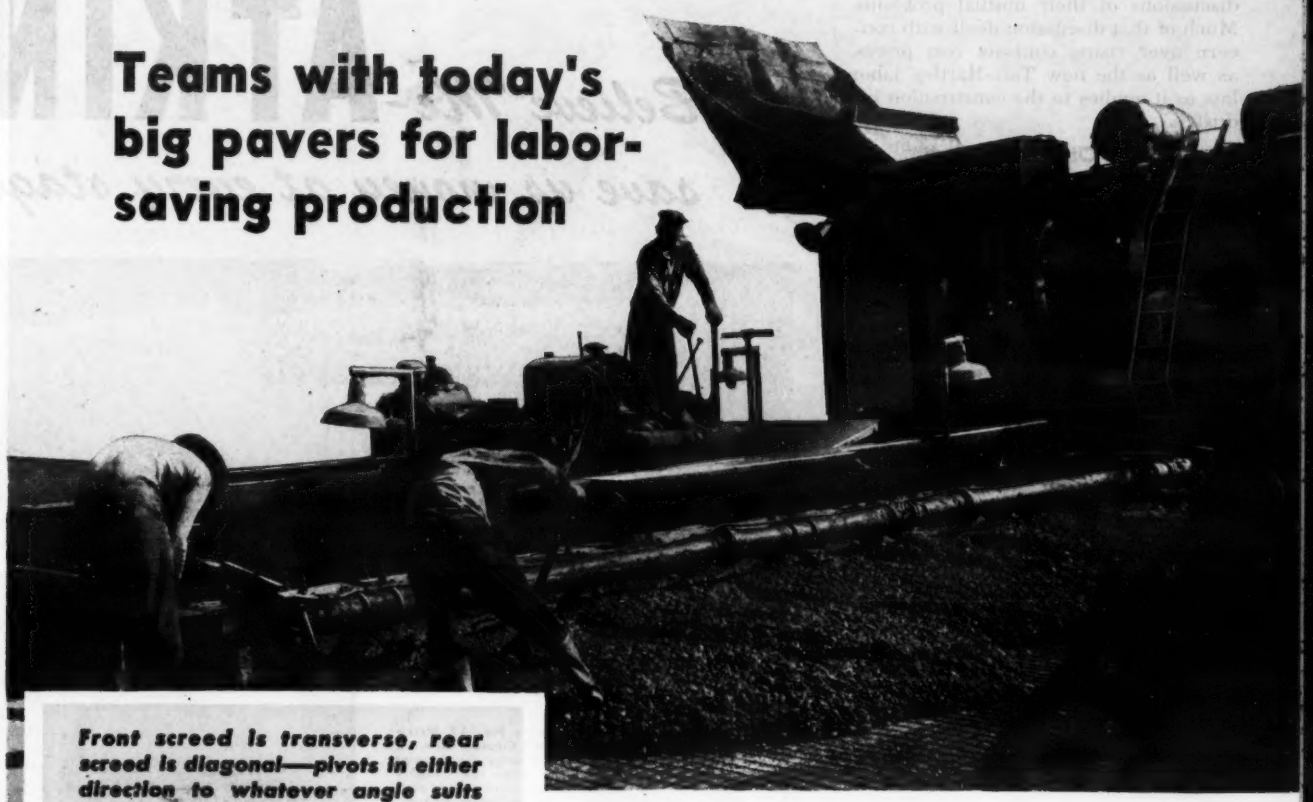
Several tables and other data are listed to help the catalog reader determine which hoist is best suited for a particular need. The information covered includes: how to calculate the rope capacity of a drum; the weights of certain materials in pounds per cubic foot; approximate breaking strength and usual working loads of 6 x 19 wire rope; and a table giving the tension in pounds produced in a rope by a load of a ton acting on an inclined plane.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 57.

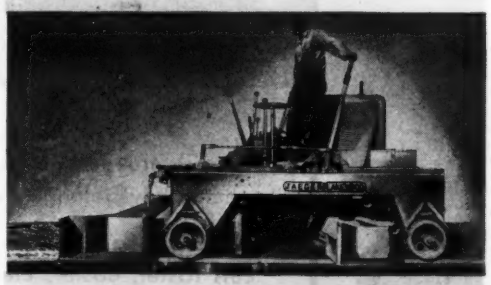
"Radio, foglights, pneumatic tire—but I still have to push it!"

Jaeger diagonal screed finisher

Teams with today's big pavers for labor-saving production



Front screed is transverse, rear screed is diagonal—pivots in either direction to whatever angle suits the work.



Re-Mixing-Compacting Spreader Gives 2-Paver Capacity with Minimum Paving Crew

The Jaeger 1948 model Concrete Spreader, teamed with a Jaeger Diagonal Screed Finisher, will spread and smoothly finish all the yardage you can pour with as many as two 34E dual drum pavers — makes paving a precision, mass-production operation done by power machinery. Re-mixing, compacting spreader screw, exclusive with Jaeger, eliminates segregation and resulting honeycomb, positively produces a denser, more uniform pavement than other spreading methods. Wide, oscillating strike-off can be furnished for concrete work or bituminous spreading-finishing.

FIRST BASIC IMPROVEMENT IN 31 YEARS

Job-tested for 18 months, on highways from New York to California, the Type "X" Diagonal Screed Finisher now offers you six proved advantages for your 1948 paving work:

1. ***More accurate than any transverse finisher:*** Diagonal rear screed, always meeting the material at a point different from the transverse front screed, equalizes irregularities due to forms or other causes, slices off high spots, fills in the low ones.

2. ***Less hand work and equipment needed behind finisher.***

3. ***Finishes flush to upper form on curve elevations and pitched slab:*** Angle of screed, controlled by operator, automatically carries material uphill and compacts it solidly against the top form.

4. ***Eliminates or greatly reduces carry-back, saving one to two shovelers' wages.***

5. ***Finishes faster without tearing, saves extra passes:*** Diagonal screed works final roll of material at an angle, a real advantage when finishing stiff mixes.

6. ***Capacity to match biggest pavers:*** Fast and flexible, with a wide range of screed speeds *all independent of traction,* finisher easily keeps pace with dual drum paver output on half-width or full-width work.

THE JAEGER MACHINE COMPANY, Columbus 16, Ohio

REGIONAL OFFICES: 1504 Widener Bldg. Philadelphia 7, Pa. · 226 N. La Salle St. Chicago 1, Ill. · 235 American Life Bldg. Birmingham 1, Ala.

AGC Delegates Hold 29th Annual Meeting

Labor and Cost Problems Spotlight the Convention As Contractors Discuss Vital Issues

✦ "THE time has come for this country to go to work. We can delay no longer."

Spoken by philosopher-humorist Jeff Williams of Chickasha, Okla., these words symbolized the spirit of the 29th annual meeting of the Associated General Contractors of America, when more than 2,000 delegates met in Dallas, Texas, February 9-12, 1948. Williams drew repeated applause as he urged all present to adopt the simple but sound virtues of integrity, skill, judgement, and a sense of humor.

Contractors, Federal and state agencies, and labor—all sides of the construction business met face to face in frank discussions of their mutual problems. Much of that discussion dealt with concern over rising contract cost prices, as well as the new Taft-Hartley labor law as it applies to the construction industry.

New Officers Elected

New officers elected for the coming year are headed by Dwight W. Winkelman. He is the new President of AGC, and succeeds F. W. Parrott of the C. F. Lytle Co. of Sioux City, Iowa. Mr. Winkelman is the President also of the D. W. Winkelman Co. of Syracuse, N. Y.

The new Vice President of AGC is Adolph Tiechert, Jr., a member of the contracting firm of A. Tiechert & Son of Sacramento, Calif.

Resolutions Adopted

Of the 20 resolutions adopted at the 29th annual meeting, many have important bearing on present and future construction over the country. For example, benefit payments for activities of labor not directly related to production are not to be encouraged by any chapters of the organization.

A resolution was adopted calling for recovery of damages in cases of non-delivery of materials furnished by the Government, in cases of non-performance by other contractors, or in cases of unjustified stop orders.

The Associated General Contractors also recommended a continuation and intensification of its apprentice-training program in all the building trades.

The previous policy on escalator clauses in contracts was reaffirmed. No escalator clauses were recommended on projects lasting less than 2½ years, and escalator clauses on longer work were recommended only after a meeting of owners and contractors interested in that particular job.

The association recommended to the U. S. Bureau of Reclamation that it adopt some satisfactory form of continuing contract, so that contractors who bid on USBR work may know what funds are available for contract payments. This would prevent a repetition of 1947, when contracts were shut down on short notice.

One of the strongest resolutions concerned lettings on Monday, or on days which closely follow holidays. Pointing out the difficulty of coordinating materials and subcontract bids, the contractors called for letting dates on other days than those mentioned.

Another resolution would give contractors the option of taking into the nearest Federal court any claims for losses sustained by acts of the Government on Government work, provided that the contractors had exhausted all the prescribed processes of settlement with the agency concerned.

The assembly called for the limitation of force-account work and day-labor activities especially by the U. S. Bureau of Reclamation; for orderly long-range public construction programs spaced over the longest period of time consistent with the needs for such work. It asked for immediate legislation to increase allotments to engineering investigations, advance planning, design, and supervision in the Denver Office of the U. S. Bureau of Reclamation. And it reaffirmed the opinion that highway-department pay scales should be upped to attract enough competent engineers to our highway department.

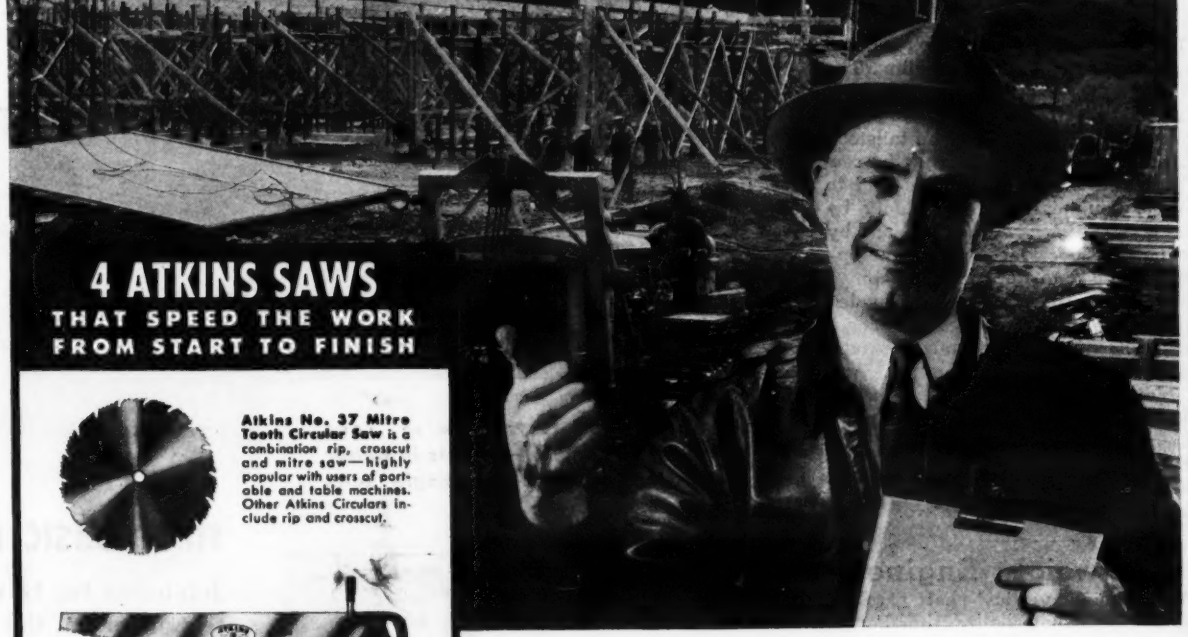
It was recommended that the Joint Cooperative Committee of the American Association of State Highway Officials and AGC, heretofore on a national scale, be decentralized to include similar organizations at state levels. Other resolutions called for a continuing highway program of at least $500,000,000 to be appropriated yearly; for uniformity in repair-parts catalogs as furnished by manufacturers of construction equipment; and for the immediate channeling of all new construction equipment to American contractors. Equipment sent overseas under the Marshall plan should be made up of rebuilt or repaired units, the resolution pointed out.

Taft-Hartley Law Discussed

The Taft-Hartley labor law, and how it applies generally to the construction industry, drew the interest of most of the delegates in Dallas' Baker and Adolphus Hotels, as key national figures from Washington, D. C., discussed the

(*Continued on next page*)

"Believe Me-ATKINS save us money at every stage of the job"



4 ATKINS SAWS
THAT SPEED THE WORK FROM START TO FINISH

Atkins No. 37 Mitre Tooth Circular Saw is a combination rip, crosscut and mitre saw—highly popular with users of portable and table machines. Other Atkins Circulars include rip and crosscut.

No. 390 One-Man Crosscut. Taper ground, cleans easily, runs fast. Tuttle tooth, straight back blade is hardened and tempered. Needs very little set. Hardwood handle with large grip. Filed and set, ready for use.

Atkins No. 3000 Handsaw. The latest addition to the Atkins line of handsaws for every use. Has new "Perfect-Grip" Plastic Handle that brings grip closer to the blade and gravity center. Light but stiff "Silver Steel" blade, true taper ground. Straight back, ship point.

Atkins No. 10 Easy Grip Hack Saw Frame. Black rubber handle gives complete control of the stroke, protects hands. Cold-rolled rust-resisting steel frame adjustable 8 to 12 inches. Atkins "Blue End" Hacksaw Blades are tough, fast-cutting, long-lasting.

Yes, it's true; Atkins Saws keep construction sawing costs where they belong — down at sub-basement level.

For every sawing job there's a particular Atkins Saw that cuts faster, easier, cleaner — that represents all the skill, knowledge and improvement gained in 92 years of saw-making experience. Because of the characteristics of Atkins "Silver Steel", these saws stay sharp longer and last longer. When the pressure is on and the backlog high, you can count upon those extra-keen teeth to keep cutting smoothly for record periods. All this adds up to these important factors on your ledger sheets: lower labor costs, less time out for sharpening, greater cutting output.

Invest on the profit side of the ledger. *Check with your industrial distributor now on the Atkins Saws you need.*

ATKINS "ATKINS ALWAYS AHEAD"

E. C. ATKINS AND COMPANY • *Home Office and Factory:* 402 S. Illinois Street, Indianapolis 9, Indiana
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MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

Photograph by Shelburne
Dwight W. Winkelman was installed as President of the Associated General Contractors of America for 1948 at the association's 29th annual meeting. He is also President of the D. W. Winkelman Company of Syracuse, N.Y.

issue. The new law and its relation to the industry was the subject of an address by Robert N. Denham, General Counsel of the National Labor Relations Board.

Pointing out that construction is definitely a business which affects commerce, Denham said that contractors and contract labor will now definitely come under NLRB jurisdiction in case of complaints by either side. He pointed out that the traditional closed-shop contract is forbidden, and that secondary boycotts make injunction proceedings mandatory. The refusal to handle struck work, or so-called "hot materials", is now illegal.

The practice of requiring stand-by crews, he said, is prohibited as a part of the "featherbedding provision". And the imposition on new members of excessive initiation fees is described as an unfair labor practice which can be charged to a labor organization.

No longer, in the absence of a contract, can a contractor commit himself to hire only union members in good standing, Denham pointed out. Further, the new law legitimatizes no union-shop contract nor other form of union security dated after August 22, 1947, which has not been authorized by secret ballots of the majority of the employees in a unit that is appropriate for that purpose.

Denham then advised the delegates that machinery has been set up by the NLRB to conduct the necessary union elections, and asked the assembled contractors for their assistance in determining four main factors called for in the Taft-Hartley law:

1. The Government must determine who is an identifiable employer having authority to bargain collectively with employees.
2. The labor organization or organizations habitually recognized by this employer must be determined.
3. A description of an appropriate unit of employees represented by such labor organizations in connection with their employment by the employer group must be determined.
4. The number of individuals, as of a given date, which make up that appropriate unit must be determined.

Denham pointed out that the task of holding the necessary elections calls for the cooperation of management and labor alike, and urged a plan which would reduce to a minimum the necessity for Government intervention.

"It would be almost ridiculous for me to attempt to define for you the tremendous advantages of any program that will substantially diminish these jurisdictional disputes which, at least in the public eye, have so frequently interfered with building operations", Denham said to the group.

AFL Presents Plan

A concrete plan for settling jurisdictional disputes in the building and construction industry has now been worked out. It was presented in outline to the delegates by Richard J. Gray, President of the Building and Construction Trades Department of the American Federation of Labor.

The plan would provide that all jurisdictional disputes not settled at a local level within ten days be referred to a five-man board in Washington. The board would be made up of two labor representatives, two management representatives, and an impartial chairman.

Gray called it "the first fully comprehensive and thoroughly implemented charter for self-government, dealing with a specific problem of industrial relations, in any major basic industry". The plan was endorsed by Denham, and highly recommended to the AGC.

As outlined by Gray, the plan would have these characteristics:

1. The five-man board would be known as the National Joint Board for

(*Continued on next page*)

Flink SELF FEEDING SPREADER

- Spreads all materials to 1"
- Spreads thick or thin as desired
- Attaches to truck as a tailgate
- Does not limit use of truck
- Controlled from cab
- Starts spread with truck in motion
- Stops spread with truck in motion
- Self feeding—no helper on back
- Spreads forward or backward
- Half or full width of street
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- Positive uniform spread
- Fits any dump truck
- Thousands in use

Makes you a Spreader and Dump Truck Combined

Use fewer men—trucks—time. . . . The practical, economical, efficient Flink spreader that has proved itself in a thousand tough road construction and maintenance jobs . . . in ice control and dust control all over America. Write for complete information.

THOUSANDS USED BY CITIES, COUNTIES AND STATES

For name of distributor near you, write
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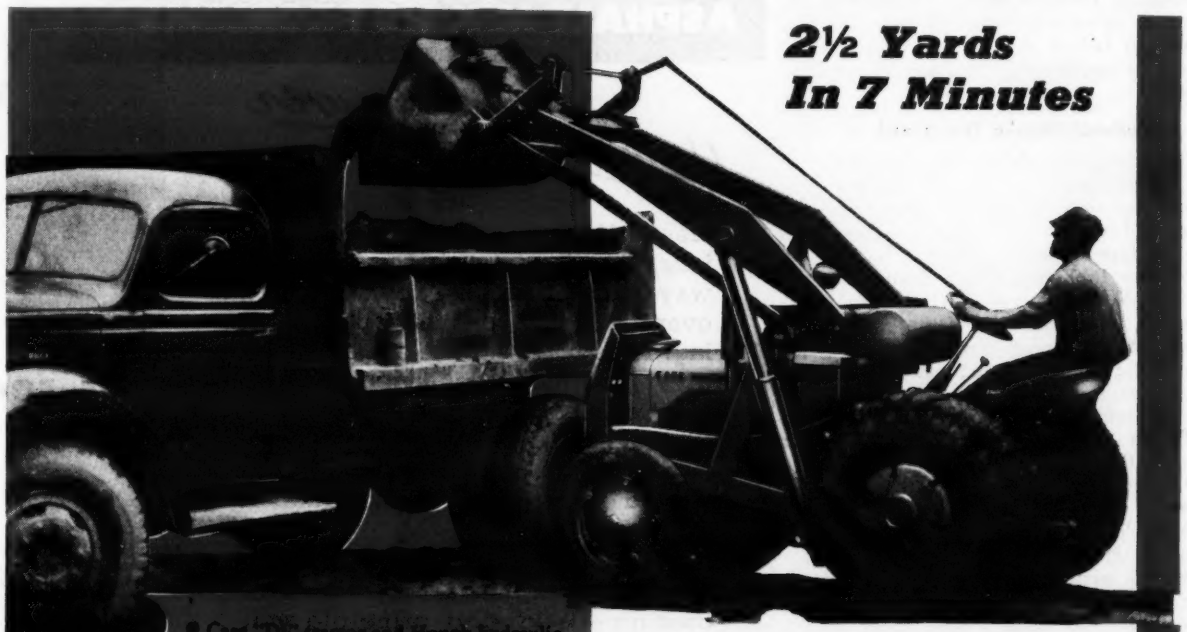
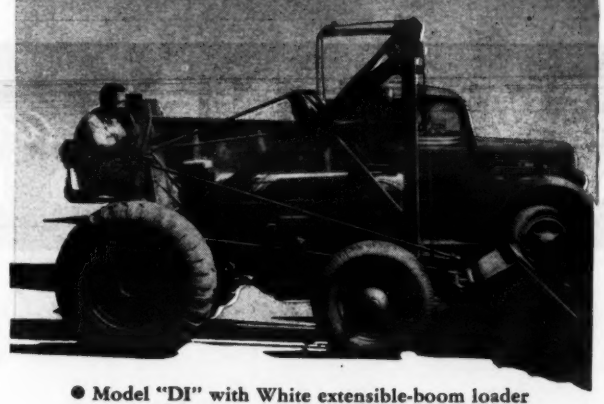
LOADING HEAVY, WET CLAY



● Case "DI" tractor and Hough hydraulic loader, shown above, are filling 2½-yard trucks in seven minutes with wet, heavy clay from a street-widening operation.



● Model "DI" with White extensible-boom loader not only picks up and loads ready-mix material but reaches out and dumps it in the center of the truck.

It's the Power Behind that Puts You Ahead

You get more yardage per man-hour when the power behind the shovel is eager, flexible, easy to handle. With the way their engines pull steadily when throttled down, plus the velvet action of their robust clutches, Case tractors give quick and confident control to the man at the wheel. Their sure-footed traction and stability, plus extra strength to stand up under added loads, make them ideal power for loaders, cranes, winches, snow-plows, highway mowers and rotary brushes. Case industrial tractors, in four basic sizes, cover a weight range from 2500 to 10,000 pounds. For ENDURANCE as well as performance they have earned an enviable reputation.

CASE

Your Case industrial dealer is strategically located to serve you conveniently, staffed and stocked to serve you well. Besides Case tractors and engine units he offers a well chosen line of related equipment such as tractor-mounted cranes, loaders, winches, snow-plows and rotary brushes. Specializing in the power and equipment problems that prevail in your area, he has broad experience that can be helpful to you in the choice, use and care of equipment. J. I. Case Co.,

● Lull shovel-loader with ram-controlled bucket, powered by Case "SI" tractor, takes agricultural lime from quarry pile, pours it gently into truck.

AGC Delegates Hold 29th Annual Meeting

(*Continued from preceding page*)

the Settlement of Jurisdictional Disputes.

2. One of the board's two employer members would represent the participating general contractors in the industry, and one the participating national associations of specialty contractors.

3. A 24-man group, representing both industry and labor but not connected with specific disputes, could be drawn on by the chairman to assist him in rendering decisions.

4. An 8-man board of trustees, equally divided between labor and management, would have administrative responsibility, and would investigate all claims before they are referred to the joint board.

5. The organization's budget would be equally distributed between industry and labor.

The plan was ratified February 12 by the AGC and became effective March 8. Seven national organizations of specialty contractors ratified establishment of such a board on February 10 in Washington, D. C. The convention authorized Managing Director H. E. Foreman to sign an agreement with the organizations on behalf of the association to share in establishing the national joint board.

Federal Works Discussed

The contractor delegates heard most of the eminent Government construction chiefs over the country outline past accomplishments and future prospects for all types of public work.

Walker R. Young, Chief Engineer of the U. S. Bureau of Reclamation at Denver, told something of the gigantic program now under way by his agency. But he also pointed out some of the difficulties for any contractors who bid on reclamation work.

Funds authorized by Congress for reclamation projects, Young reminded his listeners, are allotted to a specific project, or even to a specific part of a project. There can be but very limited transfer of funds, and thus when the available appropriations for a project are exhausted, the Bureau has but one alternative—to issue a stop order on that project.

While the thing which naturally suggests itself is to eliminate or reduce this earmarking of Reclamation funds for specific features, Young advised the delegates that "undoubtedly Congress would fear that this would open too wide a door for undesirable manipulation of the appropriated money".

Rather, Young said, a more promising course would be to make administrative allocations of appropriated money immediately on passage of the appropriation act. In this modified form of the Bureau's present operating procedure, the appropriation for a feature would be broken down to allocate so much money to administration, so much to right-of-way acquisition, so much to material and equipment, and so much to contract payment.

While he was discussing proposed change requests concerning costs and escalator clauses, Young told the delegates that "when contractors endeavor to eliminate all risks from their contracts, they are really making an argument against contracting".

He also discussed the desirability of short-term versus long-term contracts, the standard form of Government contract, and in talking of appeals said that the Solicitor of the Interior Department recently has been given the authority to decide these issues.

Lieut. Gen. R. A. Wheeler, Chief of Engineers, U. S. Army, was unable to attend the meeting, but his prepared remarks were read to the delegates by Colonel Henry Hutchings, Jr.

General Wheeler complimented the AGC chapters throughout the nation for having made excellent progress towards a goal of 100 construction units affiliated with the Army Engineer Reserve Organization Program. In all, 64 of these units have now been formed in 63 AGC chapters throughout the nation.

Of special concern to the General was the matter of joint bids submitted on Army contracts. Citing the case of the Buggs Island Project on the Roanoke River, General Wheeler pointed out that only three bids had been received on the project from a total of thirteen firms.

"I appreciate that this tendency is prompted by a desire to spread individual risks", his paper said. "And I also appreciate that many firms may hesitate to tie up their resources in a single large contract, preferring to be in a position to participate in other large-scale operations.

"However, perhaps inadvertently, the practice is operating to preclude a wide—and desirable—competition. And this, in my opinion, is possibly a reason why bids on Buggs Island and other projects have been much higher than our own estimates for the work."

Navy Aims Spoken

The forthcoming program of the Civil Engineer Corps of the Navy Bureau of Yards and Docks was outlined by Rear Admiral John J. Manning, CEC, USN. The Navy's four basic problems, complicated by lack of funds, were these, according to Admiral Manning:

1. Temporary construction for World War II has deteriorated as was to be expected, and portions of it must now be replaced with permanent facilities.

2. Funds for new construction have been very limited, and at the same time high costs of material and labor have reduced the Navy's ability to stretch those funds.

3. The unsettled international situation has made it mandatory that the Navy develop new types of shore facilities. These would be required to defend the country against a sudden attack with radical new weapons, according to Admiral Manning.

4. Plans must be developed for the full and immediate use of trained engineering and construction forces in the new Naval Reserve training program.

Other Subjects Discussed

Pledging the full cooperation of his organization, Tom Callaway of the American Road Builders' Association called for unity between the ARBA and AGC. In an extemporaneous talk before a general session, Callaway told of plans for the forthcoming Road Show in Chicago from July 16-24, 1948.

Speaking on aspects of the construction industry from the architect's standpoint, William Stanley Parker, Fellow of the American Institute of Architects, of Boston, Mass., declared, "The construction industry should seek the

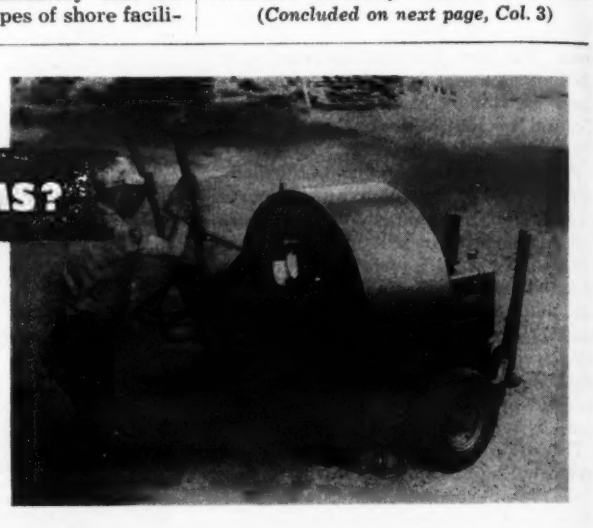
(*Concluded on next page, Col. 3*)

ASPHALT MIXING PROBLEMS?

Here's the answer

Here's the answer to small asphalt jobs, patching jobs, driveways, parkway maintenance — anything and everything that calls for asphalt mixing. The Foote Kinetic Asphalt Mixer gives you high asphalt output in a compact package. It handles any type of asphalt mix, hot or cold. It is fast — 3 cu. ft. in 30 seconds. It tows behind your car or truck: Take it anywhere.

It brings an unusual and new mixing principle that assures uniform coating — a mixing principle you should know about. Ask for details! Send for Bulletin K-100.



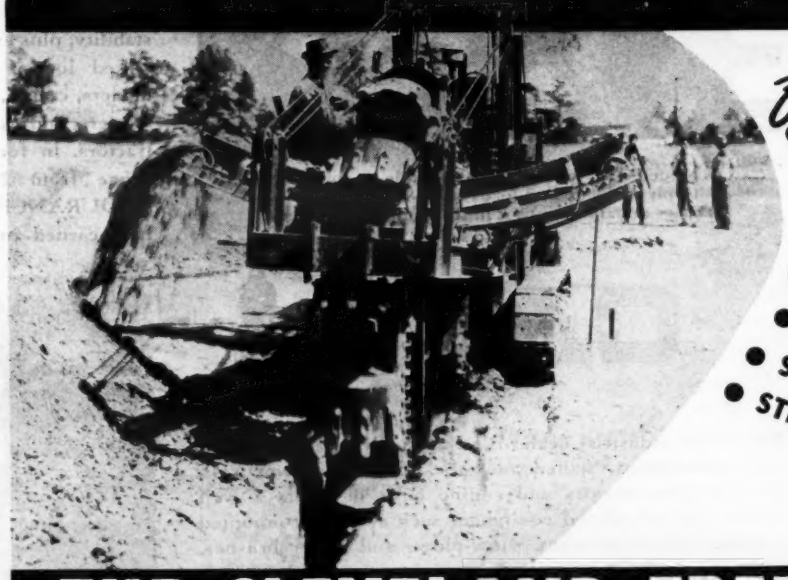
THE FOOTE COMPANY, INC.
1916 State Street, Nunda, New York

Builders of
Adnun Black Top Pavers,
MultiFoote Concrete Pavers
and Foote Kinetic Mixers

the FOOTE Kinetic mixer

(*Also see page 77*)

CLEVELANDS *are noted by*
CONTRACTORS AND UTILITIES



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- DEPENDABILITY
- VERSATILITY
- MOBILITY
- OPERATING ECONOMY
- LOW COST MAINTENANCE
- SPEED ON THE JOB
- STRENGTH

TRADE MARK

THE CLEVELAND TRENCHER CO.
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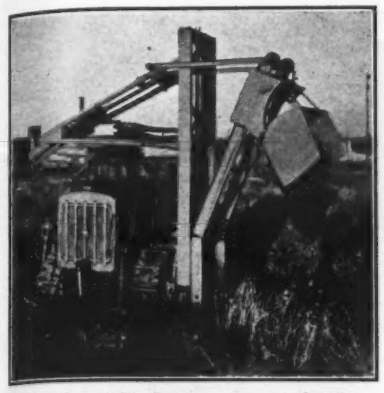


Swinging 180 degrees on a circular track, the Swing-Around bucket loader permits operation from either side of the crawler tractor on which it is mounted. Buckets available are from 1 to 2½ cubic yards.

Bucket Loader Swings In Horizontal Circle

A tractor-mounted loader which can be swung in a 180-degree horizontal circle from one side of the tractor to the other is made by Decker Bros., Inc., 331 U. S. National Bank Bldg., Denver 2, Colo. This feature permits operation from either side of the tractor, and a truck can get into position on one side while another truck is being loaded on the other side.

Power for the Swing-Around loader is obtained from the crawler-tractor engine, and is applied through a simple hydraulic system. Controls are said to be positive-acting and located within easy reach of the tractor operator. The manufacturer states that three complete cycles can be made every minute.

Buckets available for use with the Swing-Around range in size from 1 to 2½ cubic yards. The unit is designed for use in grading or ditching operations, as well as excavating and material handling. It is designed to fit most popular models of crawler tractors.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 21.

Hammer and Drill Unit Combined in One Tool

Information sheets on its combination electric hammer and drill unit have been issued by the Wodack Electric Tool Corp., 4627 W. Huron St., Chicago, Ill. The Do-All electric tool is a hand unit weighing 15 pounds. It utilizes one motor to perform two types of work—to drill concrete, masonry, metal, or wood; and to drive grinding, buffing, or wire wheels. According to the manufacturer, the tool has a no-load speed of 1,450 rpm when used as a drill; and when used as a hammer, it will deliver 2,400 blows per minute.

Bulletin No. 471 describes this tool in detail and lists its applications. It covers specifications, as well as the four tool-and-accessory kits which have been made up by Wodack. Also listed are the various accessories designed for use with the Do-All unit, and a reprint of the Wodack guarantee.

Bulletin No. 472 is concerned primarily with the Wodack star drills designed for drilling holes in concrete, brick, and stone. Text describes their construction and performance features, while a table lists their diameters, drilling depths, and prices. The drills vary in size from ¼ to 1½ inches in diameter, and from 6 to 24 inches in length. This announcement also describes, illustrates, and prices the tools available for use with the Do-All.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 51.

Hewitt-Robins Division

A division to handle the setting up of materials-handling and processing plants has been formed by Hewitt-Robins, Inc., New York City. To be known as Robins Engineers, the new division will handle all phases of design, engineering, and installation. Headquarters will be at 157 Chambers St., New York City.

Harold Von Thaden heads the new division as Vice President. Elmer C. Salzman is Vice President in charge of sales; and R. W. Eichenberger is Vice President in charge of the midwest office in Chicago.

AGC Delegates Hold 29th Annual Meeting

(*Continued from preceding page*)

major causes of its instability. I believe the greatest potential aid to stability lies in the better administration of local public works".

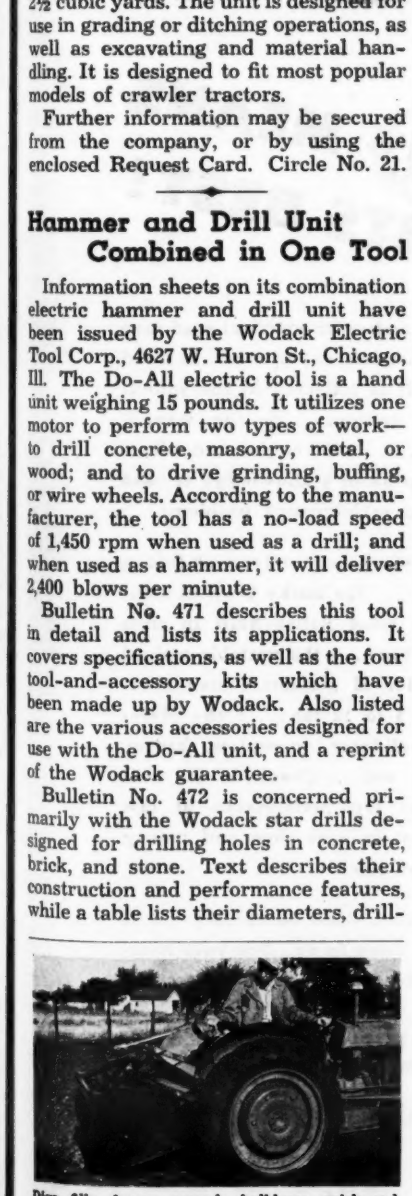
G. W. Maxon, Chairman of the AGC Legislative Committee, reviewed national legislation with particular emphasis on AGC problems.

Factors retarding public construction were told by Charles H. Sells, Superintendent of the Department of Public Works, New York State. How the railroads are operating and what they are doing to provide better freight service to contractors was reported by W. C. Kendall, Chairman of the Car Service Division, Association of American Railroads. Mr. Kendall's paper pointed out that the cost of new freight cars now runs about $8,000 each, and that the 1,200 new locomotives on order will cost between $350,000 and $400,000 each. He pointed out that the 38 per cent freight-rate increase was not abnormally high, considering that railroad wages were up more than 90 per cent since 1939 and that the cost of materials and supplies had almost doubled.

The convention closed on a new note of cooperation between all the contractors and agencies represented at Dallas, and with the outlook for the 1948 construction season more favorable than at any time since before the war.

Air Reduction Ups Three

Three promotions in its technical sales personnel have been made by the Air Reduction Sales Co., New York City. G. V. Slottman, formerly Manager of the Technical Sales Division, has been appointed Technical Assistant to the Vice President; Scott D. Baumer, formerly Assistant Manager of the Technical Sales Division, was appointed Manager of that division; and Edward H. Roper was appointed Assistant Manager.



Digs, fills, dumps, spreads, bulldozes, quick and handy on all earth moving jobs. Fits John Deere, A & B, International M & H, Ford and Case.

Write for full details

General Welding Co. 3000 So. Lawrence Rd. Wichita, Kansas

Heavy Sub-Base Laid, Topped by Road-Mix

Crushed-Rock Clay-Bound Sub-Base 9 Inches Thick, With Bituminous Surface, Laid in 70 Working Days

✦ A 9-INCH waterbound sub-base of crushed rock and clay was put down in the heat of last summer, despite temperatures of 117 degrees and a 25-mile dead haul in winds of 45 miles an hour. The job goes on the record books as one of South Dakota's toughest last season. It also resulted in one of the heaviest, most modern road bases ever built in the state.

Northern Improvement Co. of Fargo, N. Dak., did the 13-mile job between Vivian and Draper, S. Dak., under a $400,000 contract with the South Dakota State Highway Commission. The project was started on July 15, 1947, and despite the caprices of weather, was finished up in 70 working days, 50 days ahead of the schedule allowed by the specifications.

Located on U. S. 16 about 60 miles west of Chamberlain, the 13-mile section had been graded and the roadbed shaped by contract four years ago. This latest contract provided for the repair of a few soft spots in the earth subgrade, for crushing and laying about 125,000 tons of rock sub-base in lifts not to exceed 2½ inches, for mixing with this rock about 34,000 tons of clay and sand binder, and for the road-mix preparation of a wearing surface ¾ inch thick.

As finished by Northern Improvement Co., the new highway has a 32-foot-wide road-mixed bituminous wearing surface with a 0.5-inch-per-foot crown, a crushed sub-base 34 feet wide and 9 inches thick compacted, and an RC-4 seal coat with chips.

Subgrade First Repaired

The existing subgrade was still wet from spring rains when Northern moved in to the job, and in some spots it was soggy. Those places were removed by a Caterpillar D8-mounted bulldozer, good dirt was brought in, and the entire embankment re-shaped to the proper line and grade by two Caterpillar No. 12 motor graders.

Sogginess, however, was not destined to be the principal problem, for after men and equipment moved in, rain ceased to fall. The hottest, driest summer on record then set in.

Crusher Set-Up

The nearest source of acceptable rock for the sub-base was in the White River breaks, about 21 miles southeast of Vivian. The sand problem was almost as bad. It had to be brought in from the White River, about 17 miles dead haul from the job.

A crushing and screening plant, custom-built to Northern Improvement Co. specifications a few years ago by Iowa Mfg. Co., was set up to produce the 1¼-inch-minus material for the sub-base. Later, after this was in, it also produced the ¾-inch-minus material in the wearing course.

C. & E. M. Photo
The first shot of SC-3B bitumen goes into a windrow of dry crushed rock on the Vivian-Draper job from this Rosco distributor.

Pit-run material was first dug out by two LeTourneau Carryalls, pulled by D8 Caterpillar tractors. After the material had lain in a stockpile, it was pushed to a receiving hopper by a D8-mounted bulldozer, and fed to the plant by means of a Pioneer conveyor.

Sand was fed through a trap to a

(*Continued on next page*)

TO PRACTICAL MEN HUBER MEANS ROAD MACHINERY AT ITS BEST!

It is an easy matter for practical road men to spot "seasoned experience" in road machinery. It is reflected in the soundness of its design.....in the way it tackles a job.....in the engineered refinements that speak of a knowledge of road building and maintenance problems.

Huber Road Machinery reflects all this in full measure.....the husky 3-wheel automotive type Road Roller built in sizes from 3 to 12 tons....the variable weight Tandem Roller of maximum maneuverability from 3 to 12 tons.....the Maintainer for bulldozer, snowplow, broom, patch roller, etc.....each in its own way delivers top performance at low operating cost to save time and money on every road job.

Switch to Huber Road Machinery. It is the practical thing to do. See your nearest Huber dealer for a demonstration.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

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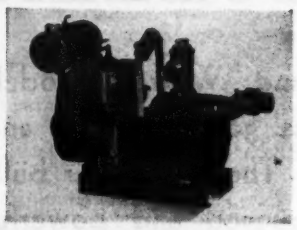
3 Wheel • Tandem
ROAD ROLLERS and MAINTAINERS

CARTER



HUMDINGER SELF PRIMING CENTRIFUGAL PUMPS

Performance—Stability—Economy—three words which embody the CARTER tradition for producing the best! Every buyer knows that it's experience which counts. You, the customer, know that only a well-tried and proven product can be relied on to do the job.

When you choose CARTER you get fifty years of manufacturing experience in the finest pump engineering skill can develop.

• *Write for Bulletin 4503*

RALPH B. CARTER CO.
HACKENSACK, NEW JERSEY
53 PARK PLACE NEW YORK 7, N. Y.

Pioneer conveyor, which loaded it to trucks.

Average production for the relatively short job was 150 tons of crushed rock per hour, with another 75 tons of sand and clay binder. The material was hauled to the job by Northern's new fleet of International K-8 12-cubic-yard trucks, and three Diamond T's of the same capacity. These trucks were rebuilt to take tandem dual wheels and larger beds. Fifteen Internationals, three Diamond T's, and enough smaller dump trucks of all makes, rented on an hourly basis, were required to keep the material moving out to the job.

On the hottest days, when temperatures went up to 117 and dust choked everyone, haul roads were watered as often as possible to get some measure of relief. Fortunately, there was a private dam and reservoir at one end of the project and a Government reservoir at the other. Because of the weather and evaporation, however, water for the project ran considerably over the estimated quantity.

Sub-Base Rolled in Thin Lifts

The accurate measurement and mixing of the sub-base were carefully carried out in cooperation with the State Highway Commission's inspectors. Sub-base rock was brought in in four courses. The first two courses were 2½ inches thick after placing; the top courses 2 inches thick.

Crushed rock, sand, and clay binder were dumped by the trucks to meet the volumetric requirements, based on a 34-foot-wide section 2½ inches thick. After the ingredients were dumped, the two Caterpillar No. 12 motor graders thoroughly road-mixed the windrow before water was added.

Two 2,000-gallon tank trucks and three 1,200-gallon trucks, all with gravity spray bars, were used to apply the necessary water. This was put in lightly, with a great number of passes. As each water truck sprayed the windrow, a motor grader followed it up and folded the material over on itself before the moisture evaporated in sun and wind.

When a section usually about a mile long was completed, the material was spread out across the highway and thoroughly compacted by three Bros Wobble Wheel pneumatic-tire rollers on the job. Motive power for these machines consisted of two rubber-tired Ford tractors, and one Allis-Chalmers.

When a 2½-inch layer had been put down, it was followed by the other layers. The surface was sprinkled meanwhile, to prevent loss of moisture. The top layer of crushed rock was smooth-rolled by a Galion 10-ton steel tandem roller to give it an even surface.

Wearing Surface Laid

Quantities of material in the ¾-inch bituminous wearing course included 800 tons of ¾-inch-minus rock and 10,000 gallons of SC-3B bitumen per mile. The crushed rock was laid down and turned by the motor graders until the surface of the rock was perfectly mixed.

SC-3B asphalt was shipped in from the Ohio Oil Co. refinery at Lovell, Wyo. It was heated by two Cleaver-Brooks 2-car tank-car heaters on the Chicago, Milwaukee, St. Paul & Pacific Railroad sidings at Draper and Vivian, and hauled out to the job by two 1,200-gallon relay trucks. It was transferred to a Rosco 1,000-gallon pressure distributor at a temperature of 250 degrees.

One mile was laid at a time, with ten shots of 1,000 gallons each into the windrow to give it the proper asphalt content. After each application of oil, the rock was bladed and laminated upon itself just as water had been applied to the base material. When the wearing material was thoroughly mixed and aerated, the motor graders laid it out to be rolled. Pneumatic-tire and steel-wheel machines soon put it down to its final compaction.

A seal coat, consisting of 0.35 gallon per square yard of RC-4 bitumen with 135 tons of ½-inch stone chips per mile, gave the new highway a good waterproof riding surface. The finished job is a smooth, durable-looking piece of road-mix construction.

Equipment Repaired on Job

Northern Improvement Co. used mobile trailer shops and a special shop-built trailer of spare parts to keep the trucks and other equipment rolling. Its

(*Concluded on next page*)

C. & E. M. Photo

The Erling family was well represented on Northern Improvement Co.'s sub-base and road-mix job on U.S. 16. W. H. Erling, left, was Assistant Superintendent, John M. Erling, center, was Master Mechanic, and H. C. Erling was General Superintendent.

TARPAULINS

Low Prices—Immediate Delivery

Size	11.6 oz.	12 oz.	14.90 oz.	18 oz.
16x20	$23.00	$27.00	$31.73	$36.07
16x24	32.40	38.88	45.60	49.44

Freight paid on orders of six or more.

Other sizes available at corresponding prices.

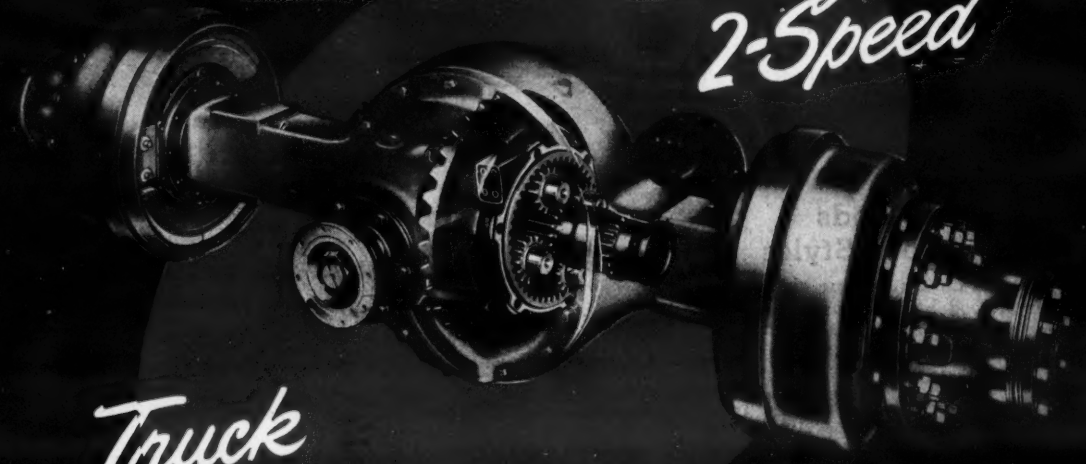
L. K. LIPPERT COMPANY

Box 202, 297 High St., Columbus 15, Ohio

Planetary Construction Gives

EATON

2-Speed



Truck

AXLES

Longer Life

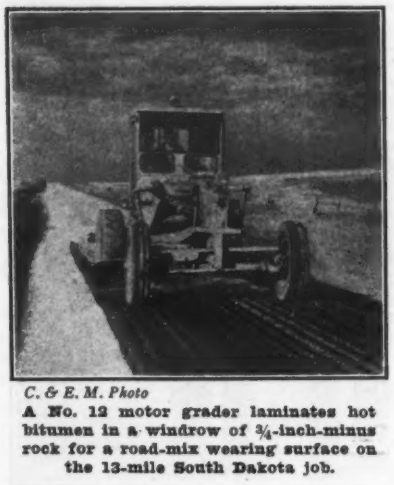
The planetary construction in Eaton 2-Speed Truck Axles provides a number of basic advantages which contribute to efficient, trouble-free operation and long life for axle and vehicle. In the low-speed power range tooth-loads are distributed over *four* "planet" gears; stress and wear on the teeth are held to a minimum. Slow gear movement makes for easy shifting and silent operation. Outstanding performance records are proof of Eaton quality and design. See your truck dealer for complete information about Eaton 2-Speed Truck Axles.

MORE THAN ¾ OF A MILLION EATON 2-SPEED AXLES IN TRUCKS TODAY

EATON MANUFACTURING COMPANY

Axle Division

CLEVELAND, OHIO



C. & E. M. Photo
A No. 12 motor grader laminates hot bitumen in a windrow of ¾-inch-minus rock for a road-mix wearing surface on the 13-mile South Dakota job.

Heavy Sub-Base Laid, Topped by Road-Mix

(Continued from preceding page)

big 40 x 10-foot trailer contained an estimated $60,000 spare-parts inventory, and was the main reason why the job was finished so far ahead of schedule. If trucks broke down, they did not stay down for very long.

Valve-grinding equipment, an engine-testing machine, and a 12-inch lathe were located in the shop trailer.

Personnel

The Draper-Vivian job, a Federal-Aid project, was designed and administered under the general supervision of H. C. Rempfer, State Highway Engineer, with R. K. Morrell in charge as Construction Engineer. T. B. Hilmer was the Resident Engineer, with headquarters at Kadoka.

H. C. Erling was in charge of the work as General Superintendent for Northern Improvement Co., with W. H. Erling on the job as Assistant Superintendent and John M. Erling as Master Mechanic. Jack Ellingson was the Crusher Foreman, and Chester Becker was in charge of the road-mixing.

Hard-Surfacing Rods Made in Four Styles

A new group of hard-surfacing electrodes is announced by the Harnischfeger Corp., Welding Division, 4419 W. National Ave., Milwaukee 14, Wis. There are four electrodes in the new P&H Hartop series—brown, green, red, and yellow —covering a Rockwell C range from 45 to 63, as deposited.

Hartop brown is said to provide a 45 to 50 Rockwell C hardness. The company recommends it for welds subject to angular shock and abrasion, explaining that the deposits won't chip or spall along the edge from glancing blows or sudden loading. Hartop green is designed to provide a high resistance to impact and abrasion, and strong bonds on carbon and alloy steels, manganese steels, and cast iron. Its Rockwell C listing is from 45 to 50.

The Hartop red is for severe abrasion, and for high resistance to shattering impact. Rockwell C hardness is 45 to 50. The Hartop yellow is rated at a Rockwell C hardness of from 58 to 63, and is said to resist abrasion and deformation caused by weight and impact.

A feature claimed for all four of these Hartop electrodes is their easy, stable arc, with no sputtering or hum and with a smooth quiet flow of the weld metal. Cleaning is not required as there is no slag to remove, the manufacturer points out.

These P&H rods are packaged in a new style of container, designed to hold 5 pounds of rods. It has an air-tight screw-on top to keep it moisture proof. And instructions for using each type of Hartop are printed on the tube, to eliminate the problem of lost procedure sheets.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 40.

Catalog on Line of Jacks

A 12-page catalog on its line of jacks has been put out by the Hein-Werner Corp., Waukesha, Wis. Catalog No. 47 describes general features such as the Heinite piston; the pressure-tested castings used for the handle socket; the Hein-Werner model numbers which signify style, capacity, closed height, type of base, and other details.

The announcement also discusses the 1½, 2, and 4-ton hydraulic service jacks; the 20, 30, 50, and 100-ton industrial jacks; the 3, 5, 8, and 12-ton truck jacks; and the V-1.20 and E 1.7F 1½-ton car jacks. Each of these models is illustrated, and accompanying text covers its special features and uses.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 78.

NOW Rolled from Alloy or Mild Steel

Caine CORR-PLATE Steel Piling

Rolled from a new steel alloy, Caine Corr-Plate is now 25% stronger and has nearly 100% greater corrosion resistance. This alloy makes available equal strength and nearly double the life in a 25% lighter piling. Approved by Highway Departments and U. S. Engineers.

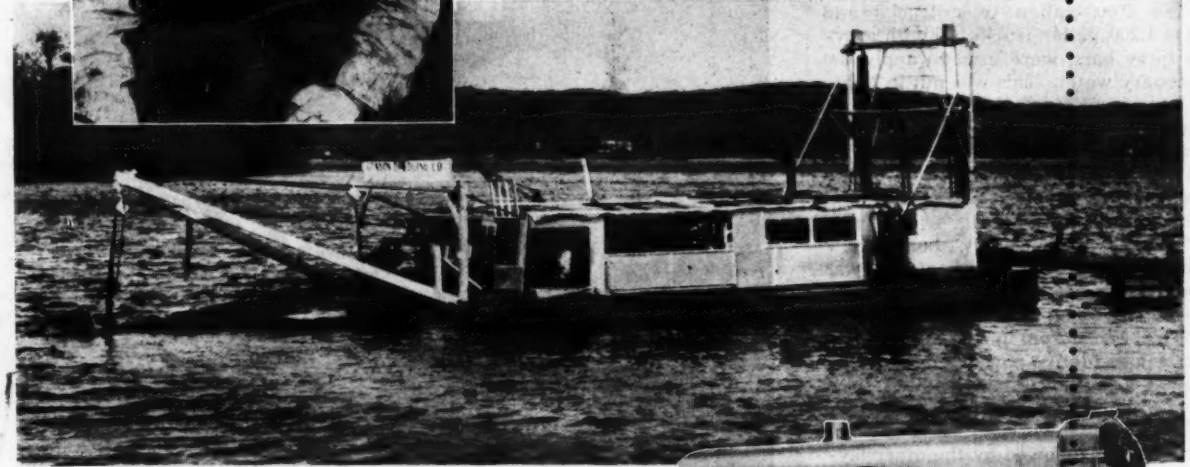
Caine Corr-Plate Steel Piling has been used the world over for Foundations, Dams, Retaining Walls, Docks, Levees, Bulkheads, Sewers, Disposal Plants and hundreds of other jobs—it's stronger, lighter, nestable, easy to drive and water tight; can be re-used again and again.

Doubled life and 25% greater strength make Caine Corr-Plate Steel Piling the bargain buy in piling!

NOW, MORE THAN EVER BEFORE . . .
STRONGEST PER POUND WEIGHT

CAINE STEEL COMPANY
STEEL PILING DIVISION, 1820 N. Central Avenue, Chicago 39, Ill.

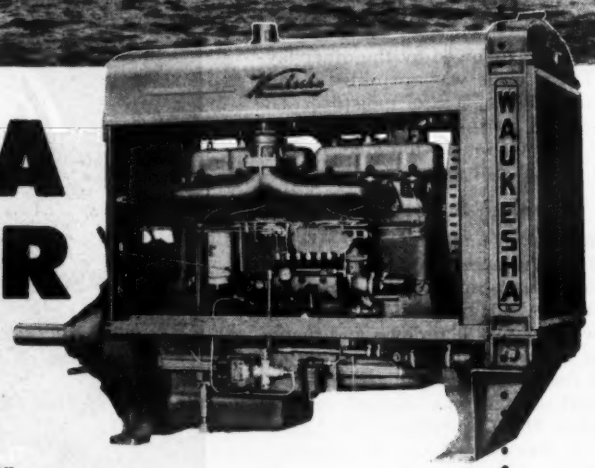
MAKING A MARSH INTO MONEY
. . . with a Diesel driven dredge



WAUKESHA *Diesel* POWER

Model 148-DKU

Six cylinders, 5¼ in. bore x 6 in. stroke; 779 cu. in. displacement



Mr. VILBERT GUNYON looks pleased. Mr. Gunyon *is* pleased—with the way this dredge is filling in acreage on the shores of Lake Geneva, Wis. It is rapidly converting a marsh into resort property that is worth a million dollars or more.

The dredge is owned by the Gunyon Dredging Co., Elkhorn, Wis. It is the sand sucking type, and a 148-DKU Waukesha Diesel Power Unit drives both the pump and the cutter head. Mr. Gunyon is particularly pleased with this Waukesha Diesel. He thinks it's the best engine that he has ever run.

Installed in the dredge in the spring of 1946, this is one of the pilot models of the 148-DKU Waukesha Diesel. The unit in the picture shows the perfected design of the 148-DKU Diesel. It runs at full capacity with a remarkably clean exhaust. You'll be pleased, too, with a Diesel like this. It has a 7-bearing crankshaft with crankpins and main bearings hardened to 600 Brinell. Removable wet sleeve cylinders, hardened to 400 Brinell. Chrome silicon alloy intake and exhaust valves; both valve seats are Stellite inserts. 24-volt electric starting system. Why not find out all about it? Send for Bulletin 1414.

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

A new Heil open-top scraper is at work on a new main-line roadbed for the Atlantic Coast Line RR near Weldon, S.C. It is pulled by an International TD-18 tractor.

Four-Wheel Scraper Has Open-Top Design

A line of four-wheel scrapers in which the overhead cables and operating mechanism have been eliminated is in full production at the plant of The Heil Co., 3000 W. Montana Ave., Milwaukee 1, Wis. The scrapers are made in 6, 9, 11, 16, and 25-cubic-yard sizes. The purpose of the open-top design is to give a lower center of gravity and improved vision for the operator, and to permit maximum heaped loads as well as loading by shovel or dragline bucket.

Down pressure to drive the cutting blade into the ground and to speed up digging and loading action, is applied through mechanical leverage. In tough going, the entire weight of the scraper bowl rests on the cutting edge, with the rear wheels lifted off the ground. The tilting floor of the Heil twin-cable scrapers is hinged just back of the cutting blade and raises to discharge the load by sweeping the sides and back of the bowl. Cables and sheaves are located outside the bowl of the scraper. A double-drum Heil power-control unit has been newly designed to provide positive control for digging, hauling, dumping, spreading, and finishing operations. Adapters are available for mounting the units on all standard makes of crawler tractors.

Two-wheel open-top scrapers of the same general design are also available for use with the two-wheel rubber-tired Heiliner.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 47.

Safe Equipment Operation

A 4-page data sheet which covers the safe operation of motor graders, bulldozers, and scrapers is available from the Construction Section of the National Safety Council. No. D-Con. 1, as it is labeled, has been recently revised by the Construction Section, and lists nine primary sources of injury connected with this type of equipment.

The sheet discusses maintenance and operation from management's point of view, and then proceeds to point out general operating precautions for operators of the equipment. It also lists precautions to be observed on specialized operations, such as clearing.

Copies of the sheet may be obtained at a price of 30 cents in quantities of from 1 to 9; 20 cents in quantities of from 10 to 99; 12 cents in quantities of 100 to 199; and 10 cents in larger quantities. Prices to members are one-half of those listed. To obtain the sheet, write to the National Safety Council at 20 No. Wacker Drive, Chicago 6, Ill.

Reflecting Road Stud

A new highway safety device is being distributed nationally by the Highway Safety Co., Inc., Hamilton Ave., Frederick, Md. Manufactured under the name Catseye, it is described as a self-wiping light-reflecting road stud to be inserted in the center line of new or existing highways.

Each Catseye has two reflecting lenses housed in a resilient bridge-shaped rubber pad. This is clipped into a metal base equipped with ramps to protect the pad. When vehicles run over the stud, the rubber pad which contains the lenses is depressed. And in the process of depression and rebound, the lenses come in contact with stationary wipers designed to clean off mud and dirt.

According to the distributor, the Catseyes will give the motorist a lighted center line from 50 to 100 yards under fog conditions, and 1,000 feet on clear nights. A special protector is available to guard the Catseyes during surface treatment against spraying, chipping, and rolling. They are not damaged, it is said, from the use of snow plows.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 99.

Stockpiled crushed stone for road surfacing is loaded into trucks by a Hough Model HL Payloader at A. Overgaard Rock Products Co., Elroy, Wis. Equipped with a 1-yard bucket, it operates 10 hours a day and handles 30 to 40 cubic yards per hour.

Jobs Done Quicker, Cheaper

Attached to Tractors, Bulldozers, Motor Graders and Scrapers, the Automatic Slope-Meters are in use on the construction of highways, airports, dams and building sites. Slope-Meters are compact, sturdily constructed instruments that will automatically show the operator the exact grade or slope on which he is working.

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NATIONAL DISTRIBUTION BY

WM. H. ZIEGLER CO., INC.

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Everywhere...

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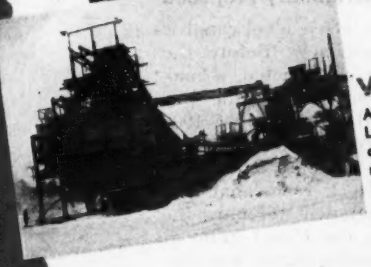
QUARRY and GRAVEL PLANTS

Completely modern . . . their Telsmith equipment units matched, balanced and co-ordinated for most efficient operation . . . these quarry and gravel plants are *typically Telsmith!* With their larger capacity and wider product diversification, they turn out a better product with less power and lower upkeep. You can get equally trouble-free and profitable operation—use Telsmith equipment and complete plant service. Send today for Bulletin EP-34.

40 years of engineering know-how is at your disposal. Consult TELSMITH Engineers.

NEW YORK

Quarry plant of Abraham Cleason, Sodus, N. Y., is effectually serving its expanding market.



VIRGINIA

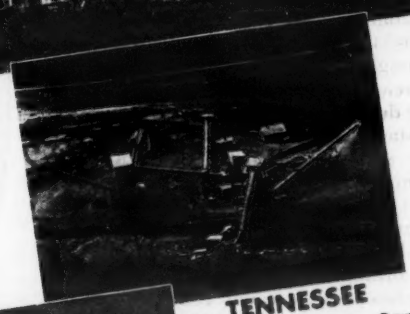
Arlington Stone Co., Leesburg, Va., produces crushed trap rock in 5 sizes to bituminous surfacing specifications.

OHIO

Camp Dennison, Ohio, all-Telsmith plant, one of six large plants of the Ohio Gravel Co., Cincinnati.

WASHINGTON

Alongside the Columbia River . . . crushing and washing plant of Howard Smith, Vancouver, Wash.



TENNESSEE

TVA's Watauga Dam aggregate plant is using four different types of Telsmith Crushers.

WISCONSIN

Waupaca Sand & Gravel Co. plant, Custer, Wis., owned and operated by F. F. Mengel Co.

NEW MEXICO

Sharpe & Fellows Contracting Co. of Los Angeles, Calif., quarry plant near Albuquerque.

MP-6

SMITH ENGINEERING WORKS, 4014 N. HOLTON ST., MILWAUKEE 12, WISCONSIN

Cable Address: Smigworks, Milwaukee

51 East 42nd St., New York 17, N.Y. — 211 W. Wacker Drive, Chicago 6, Ill. — 715 Commercial Trust Bldg., Philadelphia 2, Pa. — 247 Third Street, Cambridge 42, Mass. — Beelich Equip. Co., Milwaukee 3, Wis. — Milner Eng. & Equip. Co., San Francisco 4, Calif. — Clyde Equip. Co., Portland 9, Ore., & Seattle 4, Wash. — General Machinery Co., Spokane 1, Wash. — Braeside Machinery & Supply Co., Louisville 8, Ky. — [illegible]

Ocean-Level Canal Proposed at Panama

Converted Waterway Urged Both for Future Traffic And Security; Would Cost $2,500,000,000; 10-Year Job

✦ THE present Panama Canal should be converted from a lock-type to a sea-level canal, both to increase its capacity, and to provide for its security from enemy attack. Such was the theme of the symposium on the Panama Canal at the annual meeting of the American Society of Civil Engineers held in New York City in January. The proposed conversion would cost $2,483,000,000, it is estimated, and would take 10 years to complete.

A report urging the conversion was recently submitted to Congress by the Governor of the Canal Zone after a special two-year beginning study under Congressional authorization. The report was filed at about the same time that differences cropped out between the United States and the Panamanian government over leases for Panama Canal defense bases.

If undertaken, it would be the largest construction job in history, according to Col. James H. Stratton of the Corps of Engineers. Col. Stratton headed the committee whose investigations disclosed that "only an Isthmian sea-level canal will meet the future needs of inter-oceanic commerce and national defense".

Sea-Level Canal Originally Proposed

This proposal for a sea-level canal is neither original nor new. Before the present canal was constructed, a majority of the nine engineers on the special survey board during 1905-1906 voted for a sea-level canal. But Congress adopted the recommendation of the minority for a lock-type canal. The present studies included not only the sea-level route in the Canal Zone at the site of the existing canal, but also several other alternate locations throughout Central America and Mexico. "No other site offers advantages comparable to those of the Canal Zone for either a lock or sea-level Isthmian canal," said the report placed before Congress by Governor J. C. Mehaffey of the Canal Zone.

Before the last war, work on a third-locks project had been started in the Zone, but was halted in 1942. Its purposes were to increase the capacity of the canal; to enable it to handle larger vessels; to give it greater security from bombing; and to facilitate its conversion to a sea-level channel. However, none of the defects of the existing canal, from the standpoint of marine operations, were slated for correction in this scheme. The turns in the channel, with angles of 28, 46, and 37 degrees, are still dangerous features and sources of potential accidents.

According to the committee's findings, the present lock canal could be improved at a cost of $129,983,000 to meet the needs of commerce for the remainder of this century. A lock canal designed to meet the future needs of commerce and having the maximum security feasible in this type of canal would require new locks, and strengthening of the summit lake-impounding dams. Although it would cost $2,307,686,000, it would still be deficient in resistance to modern weapons if it were attacked.

Future Traffic Needs

By 1960, the survey indicated, the present canal will be inadequate to accommodate traffic without undesirable delays on peak days, unless additional capacity is provided. The present locks have a width of 110 feet and chamber length of 1,000 feet which restricts the design of Navy ships. Some Navy vessels cannot transit the Canal, nor can the big Queen passenger ships. By the year 2,000 the estimated tonnage passing through the Canal each year will be 87,770,000 long tons of commercial cargo, requiring 13,078 ship transits. Commercial and toll-free traffic would average 46 transits daily, while 69 transits could be expected on peak days.

A lock canal, while it could handle this traffic, would not meet the needs of national defense, no matter how strongly constructed. A determined enemy could breach the modernized locks, and knock the canal out of use for periods up to four years. The extent of damage and the length of the period of traffic interruption would depend on the nature of the weapon employed and the intensity of attack. Radioactive contamination would make repairs to the locks difficult, if not impossible.

A-Bomb a Factor

Only a sea-level canal at Panama, built by converting the existing lock canal, would be incapable of destruction by the enemy, warned the Panama Canal engineers. Rockets, guided missiles, and even atomic bombing would have little effect on a sea-level waterway whose chief value would lie in its virtually structure-less indestructibility. The atomic bomb could cause significant interruption in service, but not

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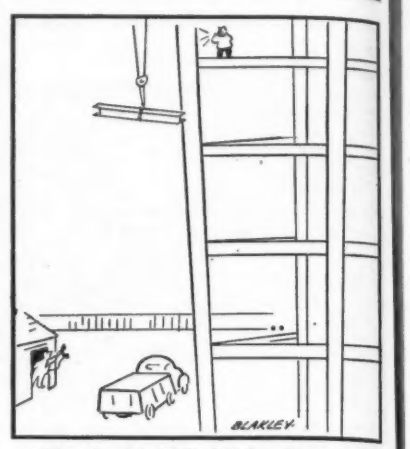

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for more than a few weeks. Slopes would be designed which not only would be stable under static loading, but also would resist dynamic forces so effectively that large explosions would not be expected to cause closure of the canal except for a brief period.

Navigation would be practicable in the sea-level canal even though tidal currents were not regulated. Tidal regulation, however, would be provided for greater safety to shipping. A tidal lock and a navigable pass would be constructed; the latter would allow the canal to be used as an open waterway during the daily periods when the velocity of the current is moderate. In the event of damage to the tidal-regulating structures, the gates of the pass could be quickly removed, and the canal operated solely as an open waterway.

Two retired high-ranking Army officers—Brig. Gen. Hans Kramer and Maj. Gen. W. E. R. Covell—and F. R. Harris, a retired Rear Admiral of the Navy, all engineers, also urged the construction of the sea-level canal. Admiral Harris furthermore suggested that a second canal be built across the Isthmus of Tehuantepec in Mexico as another step in national defense, and to guarantee assured transit between the Atlantic and the Pacific.

Big Excavation Project

Total excavation for the project, over 1,000,000,000 cubic yards, would make the sea-level canal the largest single construction undertaking in history. Of the 1,070,000,000 yards estimated, 750,000,000 yards would be excavated in the dry, while the remaining 320,000,000 yards would be dredged as wet material. This compares with the 300,000,000 cubic yards of material excavated to build the existing canal, which was completed in 1914.

The present 50-mile waterway has a bottom width of at least 300 feet and a minimum depth of 41 feet. The 23-mile channel through Gatun Lake is 85 feet above sea level. There is no difference between the average mean level of the Pacific at Panama and the Atlantic at Colon. But on the Atlantic side, the tidal range is only 2 feet as against 20 feet on the Pacific side. The new sea-level canal as proposed would have a width of 600 feet and a depth of 60 feet which would entail dredging to a depth of 145 feet below the level of Gatun Lake.

Such a deep-dredging plan involves the completion of all excavation to sea level before any of the locks are removed. This 145-foot dredging depth is considerably greater than the maximum depth of present practice. By doing the dredging in single rather than multi-stage, there would be less interference with canal traffic, the construction period would be shorter, and the cost would be less. The savings are estimated at 5 years in time, and $130,000,000 in money.

How It Will Be Done

The deepest cut in the proposed waterway is over 600 feet. For skimming off the upper layers of excavation in this area, 5-yard shovels and trucks may be used in the earth-moving. As soon as the peak of the hill is leveled, big 23 to 30-yard shovels or draglines would go into action and complete the dry excavation. Material would be loaded directly into dump scows for disposal in Gatun Lake, and some of the dirt and rock would be used in flood-control construction necessitated by the conversion. To float these scows, slips would be cut into the side of the hill so that they could be loaded by the big excavating machines without rehandling.

Wet excavation would be performed by conventional dredges, supplemented by special hydraulic and bucket-ladder dredges able to dredge to a depth of 145 feet below water surface. The dredged material would also be loaded into scows for disposal.

Both dry and wet excavation methods were discussed at the ASCE meeting by M. J. Woodhull of the Bucyrus-Erie Co., and C. M. Romanovich of the Yuba Mfg. Co. The latter concern is experienced in ladder dredges for deep gold-mining operations.

Enormous ladders to support the intake pipe would be a significant feature of the deep-level hydraulic dredges. Their great weight and length would be offset by flotation chambers, and a booster on the ladder would augment the main pump which might have a 40-inch intake and a 46-inch discharge. Extra-large spuds at the stern would also be of special heavy-duty design.

Flood Control and Run-Off

In the existing canal the surface run-off from the tributary drainage area is stored so that it may be admitted to the canal to maintain the water elevation within a narrow range. In the case of a

(*Concluded on next page*)

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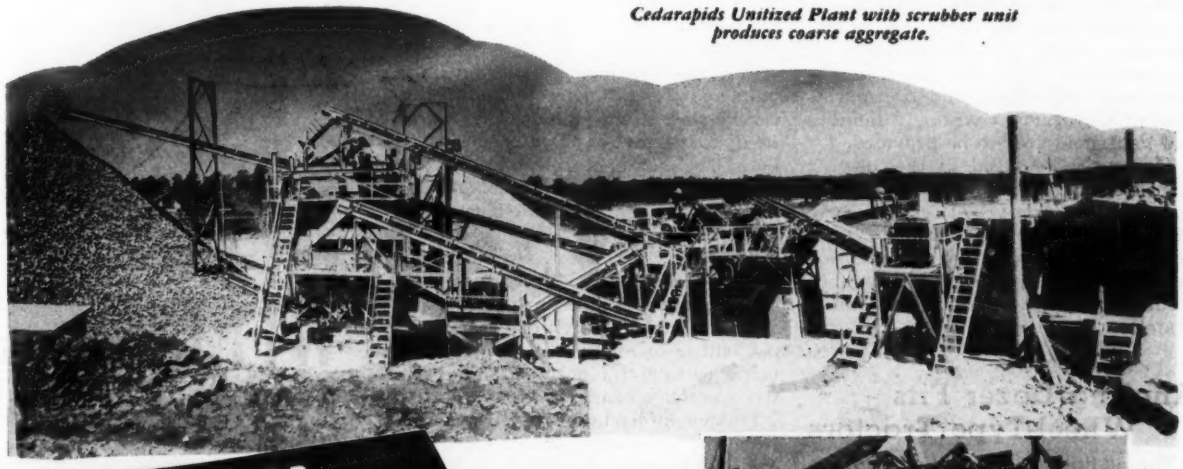

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Twin hammermill installation produces sand with fineness modulus of not less than 2.40 or more than 2.90 with not more than 0.10 variation.

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Des Moines, Iowa

BETTER ROADS FOR A BETTER WORLD — 45th Annual Convention and Road Show — SOLDIER FIELD CHICAGO — JULY 18-24, 1948

When M. O. Weaver, Inc. of Des Moines, received the contract for producing 600,000 tons of aggregate and 250,000 tons of manufactured sand for the Ft. Gibson Dam near Muskogee, Oklahoma, they selected Cedarapids equipment as best able to meet the specifications. Two Unitized Plants and twin hammermills were set up to produce the five finished sizes: manufactured sand, No. 4 to ¾", ¾" to 1½", 1½" to 3" and 3" to 6", all from limestone. The production of 250 tons per hour enabled M. O. Weaver, Inc. to fulfill their contract for aggregates specified *on time* profitably.

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THE IOWA LINE
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PRODUCT OF IOWA

IOWA MANUFACTURING CO. CEDAR RAPIDS, IOWA, U.S.A.

Ocean-Level Canal Proposed at Panama

(*Continued from preceding page*)

sea-level channel the reverse operation would be necessary. The run-off would then be diverted to the oceans to avoid producing currents that would interfere with the operation of vessels during transit of the channel. A very small percentage of the run-off that could not be diverted into the oceans would be controlled by retarding reservoirs.

The dams for creating these retarding reservoirs would be virtually unbreachable by bombing of any type, and even a breach in the levees would be of slight consequence, according to the engineering report. Only minor remedial work would be needed to restore the system to effective operation.

Personnel and Materials

A peak of 41,360 workers would be required in the construction. About two-thirds of the required man-power would be unskilled, and largely indigenous to the Caribbean area. Contracts with skilled and technical personnel, to be obtained from the United States and Panama, would include payment of transportation from the place of recruitment and return, and transportation of Government workers' families and household gear to be provided.

Man-years required in the 10-year project would total 307,910, beginning with 7,460 the first year, accelerating to 41,330 and 41,360 the next two years, and diminishing slightly in the subsequent years. Cement, steel, and lumber would be obtained from the United States.

Angling Dozer Fits Wheel-Type Tractors

The addition of an angling dozer to its line of Trojan earth-moving equipment has been announced by the Contractors Machinery Co., Inc., Clinton St., Batavia, N. Y. It is manufactured in sizes to fit the International Harvester I-4, I-6, I-9, ID-6, and ID-9 tractors. Besides the regular bulldozing position, it features six other angles, three on each side. These dozers incorporate the Trojan parallel-lift feature.

The Model No. AD-90 has a blade length of 90 inches; blade height of 23 inches; moldboard thickness of 3/16 inch; and weight of 681 pounds. The AD-90-W has a 90-inch blade length; 27½-inch blade height; ¼-inch moldboard thickness; and weighs 786 pounds. The AD-96 has a 96-inch blade length; 23-inch blade thickness; 3/16-inch moldboard thickness; and weighs 722 pounds. The AD-114 has a 114-inch blade length; 27½-inch blade height; ¼-inch moldboard thickness; and weighs 975 pounds. All models have a ½ x 6-inch cutting edge.

The Model AD-90 in conjunction with the Trojan TM-4 mounting will fit the I-4 tractor; the AD-90 with the TM-6 mounting will fit the I-6 and ID-6; the AD-96 with the TM-6 will fit the I-6 and ID-6 equipped with large wheels; the AD-90-W with the TM-9 fits the I-9 and ID-9; and the AD-114 with the TM-9 fits the I-9 and ID-9 equipped with large wheels.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 15.

Weld-Salvage of Castings

Practical procedures for salvaging cast iron, bronze, aluminum, and malleable-iron castings are set forth in an illustrated announcement issued by the Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y. This broadside stresses the use of special alloy welding rods for application at low base-metal heat. It recommends them where welding for color match, high-tensile strength, and machinability is required.

After a brief introduction, the brochure describes the general procedure to be followed when using Eutectic Low-Temperature Welding Rods. Specific information is given on welding cast iron; on sealing leaks and cracks; on salvaging malleable cast-iron and bronze castings; and salvaging aluminum, magnesium, and zinc die castings. In addition to these procedures, the broadside describes the characteristics and advantages of the various EutecRods and other equipment.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 66.

Electric Bolt Setter

An electric nut and bolt setter is made by the Illinois Gage & Mfg. Corp., 4639 W. Washington Blvd., Chicago 44, Ill. The Speed-o-matic is designed to rotate nuts or bolts at a free speed of 1,750 rpm until the point of resistance is reached; and at that point, to begin automatically to deliver impact blows at the rate of 3,000 per minute. The tool operates on either 110-volt dc or 110-volt 60-cycle ac.

The Speed-o-matic handles nuts and bolts up to ¾ inch. Direction of turning is reversible so that the machine can be used to remove as well as tighten bolts. The manufacturer states that the impact unit can be removed and replaced in less than a minute if service is required. The tool is supplied with a 0.3-hp Universal motor. Overall length is 12½ inches, and weight is 13½ pounds. It is adaptable for use with any standard 7/16-inch hex driver, and for use with a balancer. According to the manufacturer, the tool will not twist in the operator's hands.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 19.

Allis-Chalmers NW Manager

J. W. Duddleson has been named District Manager in charge of sales in the Alaska, Yukon, and British Columbia territories by the Allis-Chalmers Mfg. Co. He will operate from offices in the White-Henry-Stuart Bldg., Seattle, Wash. Mr. Duddleson succeeds E. L. Aikins, who has joined the Wood Tractor Co., construction-equipment dealers in Portland, Oreg.

Scoop Reversing Unit

A reversing fixture which permits the Hydro-Scoop to operate through a 180-degree angle has been announced by the Stockland Road Machinery Co., 2653 Thirty-Fourth Ave., So., Minneapolis 6, Minn. The Hydro-Scoop is a 10-cubic-foot earth-mover for use with hydraulic-lift rubber-tired tractors. The manufacturer explains that because of the reversing feature, the unit can now be used as a small power shovel and to reach into tight and difficult spots.

The fixture is available as optional equipment for new or previous-model Hydro-Scoops. It is made to fit Ford, International, or John Deere tractors.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 8.

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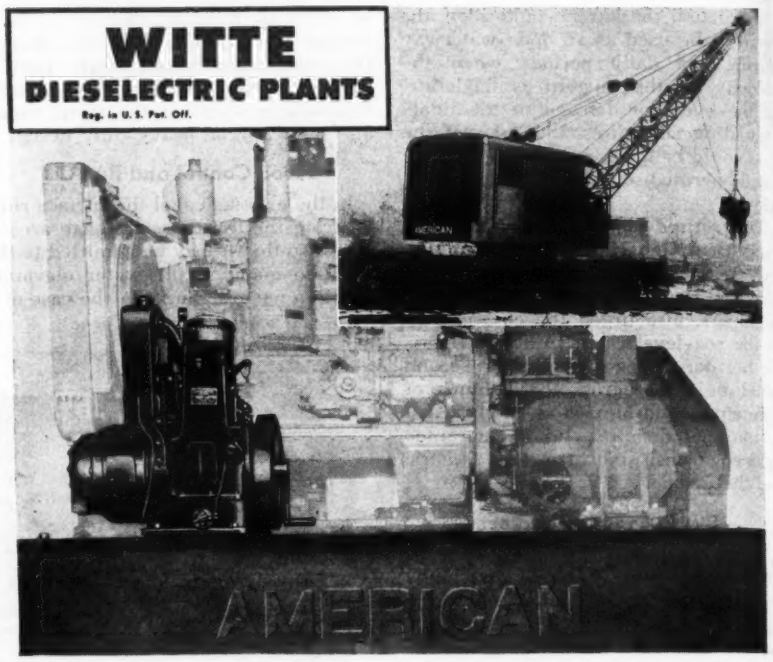
DIESELECTRIC PLANTS
Reg. in U. S. Pat. Off.



(Photo courtesy American Hoist & Derrick Co.)

WITTE *supplies reliable auxiliary power on construction equipment*

Selection of WITTE Dieselectric Plants as auxiliary powering and lighting equipment on construction projects is nothing new. But it is another reminder of the proved performance ability of these sturdy, compact producers of steady electric light and power. For day-bright visibility on night-time or underground work; for powering compressors, hoists, pumps and other equipment on your construction projects, you will find a WITTE Dieselectric Plant dependable. Being full Diesels, they start and operate on ordinary Diesel tractor fuel—at savings up to 75% over gasoline powering—and portability multiplies their usefulness. Ask your WITTE Dealer, or write for literature.

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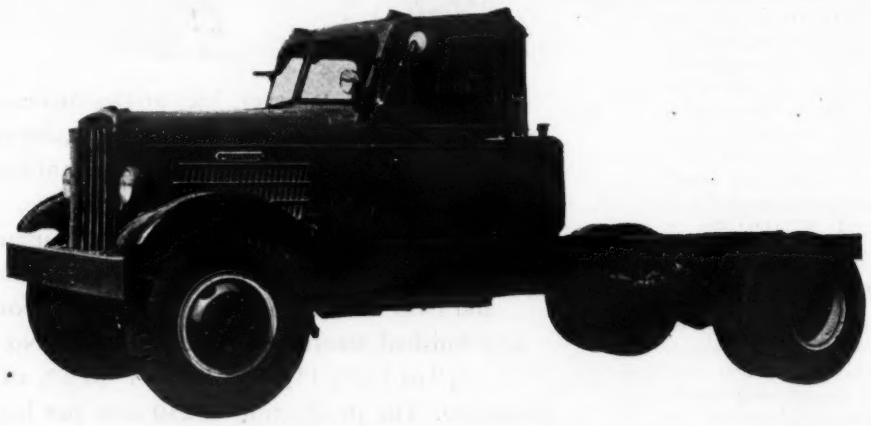

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Air Placement of Concrete

A folder which describes equipment for the air placement of concrete is now available from The Consolidated Sales Co., 801 Oak St., Kansas City, Mo. The company's Bondact Process is designed to apply new cement mortar to new or old surfaces with an absolute bond.

The folder tells how the equipment works and, by means of drawings, follows the flow of material through the Bondact gun. A discussion of why the material bonds is included. The folder also shows photographs of several buildings on which the Bondact Process was used, and lists the various applications for which the manufacturer recommends it.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 69.

Data on Cable Connectors

A catalog showing its complete line of wire-rope connectors has been made available by the Electroline Co., 4121 So. LaSalle St., Chicago 9, Ill. The cutaway drawings in this 32-page pamphlet show how the cable and strands are anchored in the Electroline-Fiege connectors. The pamphlet describes the inspection hole built into these connectors, and explains how it can be used to tell if the connection has been properly made.

There are three main types of connections—open-end or clevis-type, eye-end type, and the stud-end type—and a condensed analysis of these is included. The Electroline-Fiege connections are made in many sizes, and tables give complete dimensional specifications. One page of this catalog describes the plugs used for separating the strands of the cables, and four pages give instructions on how to use the connectors with the various styles of wire rope.

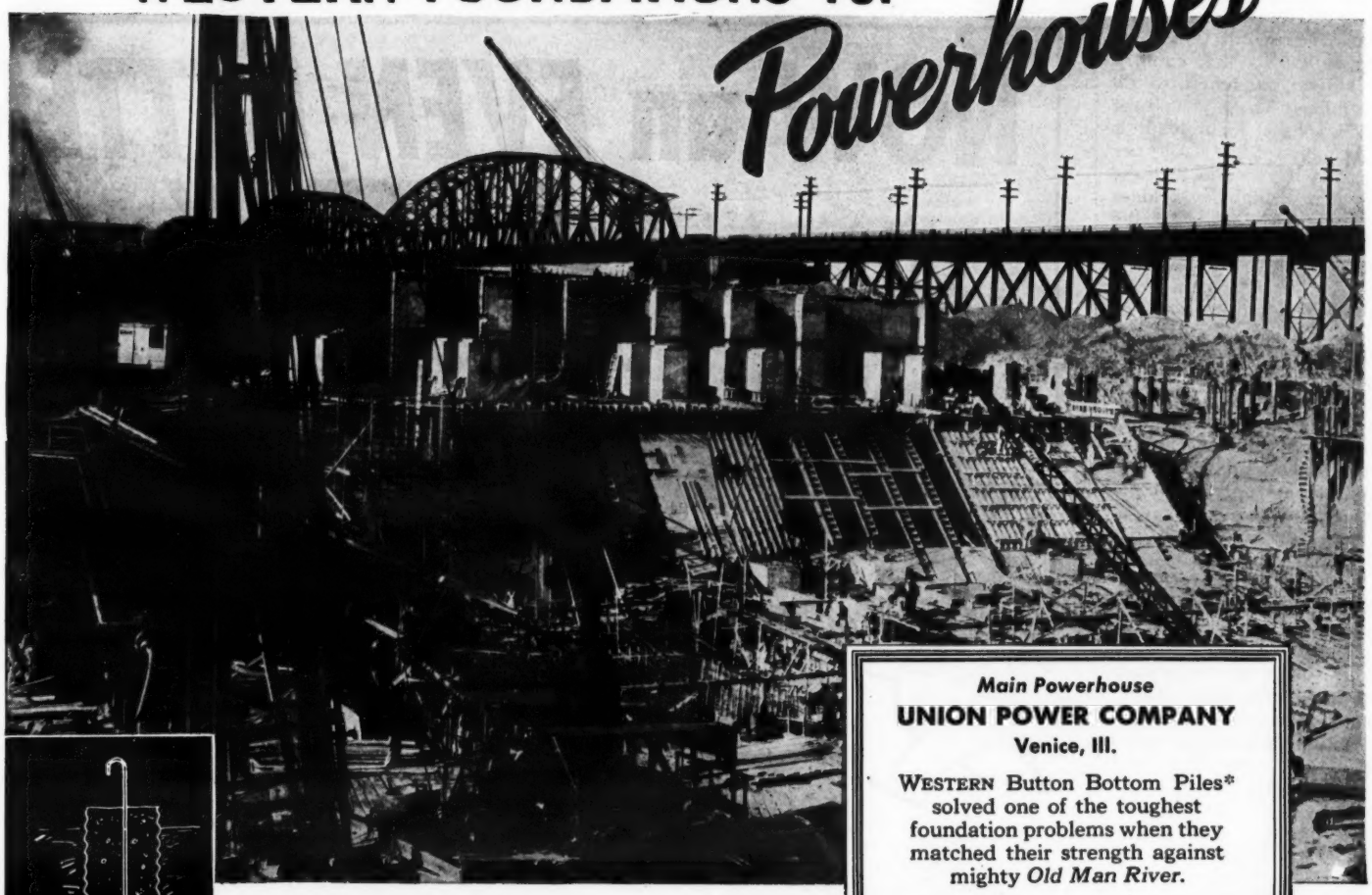
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 65.

Trailer-Makers Election

Harrison Rogers has been elected President of the Truck-Trailer Manufacturers Association. Mr. Rogers, Vice President of Rogers Bros. Corp., Albion, Pa., succeeds Julius L. Glick, President of the Truck Engineering Corp., Cleveland, Ohio.

J. C. Farrell, of Eastern Car & Construction Co., Easton, Pa., was elected Eastern Vice President. John C. Bennett, of Utility Trailer Mfg. Co., Los Angeles, Calif., and W. E. Grace, of Hobbs Mfg. Co., Fort Worth, Texas, were reelected to their positions as Western Vice President and Treasurer, respectively.

WESTERN FOUNDATIONS for Powerhouses



Main Powerhouse
UNION POWER COMPANY
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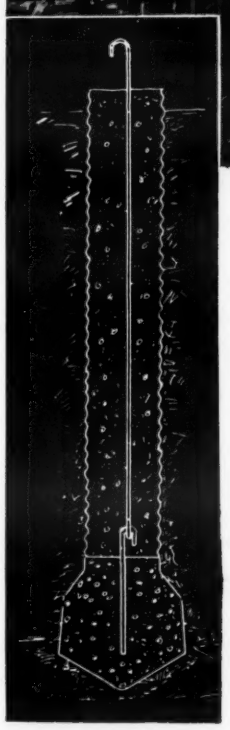
WESTERN Button Bottom Piles* solved one of the toughest foundation problems when they matched their strength against mighty *Old Man River.*



Stone & Webster Engineering Corporation, Engineers and Architects

UNION POWER COMPANY'S main Powerhouse posed an arresting engineering problem — 3200 pounds per square foot of hydrostatic uplift on the floor of the building. Here it wasn't a question of just holding the structure UP . . . the foundations also had to hold it DOWN.

WESTERN'S SOLUTION was Button Bottom Piles* combined with steel pipe piles. To meet the uplift poser, the Button Bottom Piles were designed to take tension by internal reinforcement connecting with a hook cast into the button. (See drawing.)

UPLIFT MAY BE YOUR PROBLEM, TOO . . . in a hangar; lift bridge; gas holder; smokestack; craneway; radio or transmission tower. If so, our FREE CONSULTATION SERVICE is at your disposal . . . no salesmen . . . a competent engineer to give you quick, expert advice.

AMONG OTHER UPLIFT JOBS BY WESTERN is the biggest waterless gas holder in the world . . . built for Peoples Gas Light & Coke Company in Chicago, Illinois with a capacity of 20,000,000 cu. ft.

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WESTERN FOUNDATION COMPANY
308 W. Washington St., Chicago 6, Ill.

WESTERN CONCRETE PILE CORP.
2 Park Avenue, New York 16, N. Y.

W

Viaduct Repaired Using All-Welding

The Methods Used Achieve Economies and Also Permit Structure to Be Kept Open To Traffic During Repairs

By JOHN M. HEFFELFINGER, C. E.,
Cleveland, Ohio

✦ THE purpose of this report is two-fold: first, to stress the use of welding on structures under emergency repairs; and second, to point out the possibility of special design which permits extreme flexibility in the use of these materials, combined with a high degree of economy. Most engineers are ever on the lookout for economies coupled with simple methods of assembly. And it is the purpose of this paper to show a system which meets that desire.

Someone has figured out that if all the railroad bridges in this country were put end to end, the length would be over 4,000 miles. These structures cost some $2,500,000,000 to build, it is estimated, and some $40,000,000 per year to maintain. If you add to these figures the number of highway bridges and grade-separation structures, the cost of construction and maintenance approaches astronomical figures. It is reasonable to estimate that the total amount of money invested in all bridge structures in this country is around $10,000,000,000 and the maintenance of these structures is around $100,000,000 per year. Any saving in repairs or maintenance to that number of structures, no matter how small each item is, will result in an enormous saving to the public and private pocketbook.

This report discusses the repair of the Clark Avenue Viaduct in the city of Cleveland, Ohio. The repairs consisted of the following: (1) strengthening tower members, including tower legs, bracing, bases, and caps; (2) strengthening and repairing girders, floor beams, and other members such as expansion joints in the floor system; (3) repairing trusses over a railroad yard; (4) strengthening brackets which support sidewalks; (5) replacing hand rails; and (6) repairing curbs, stairways, and fasciae.

The structure has a total length of 5,890 feet, a 40-foot width between curbs, and two 7-foot-wide sidewalks. Its deck is solid, and is made up of a concrete base with a granite-block wearing surface. The viaduct consists of three sections. The center one of these passes over a railroad yard and is subjected to more than normal corrosion from gases and smoke; moreover, the original structure was not provided with protective blast plates.

Preliminary Studies, Costs

An engineer and four structural ironworkers made a visual inspection for needed repairs. They determined that in a number of points the structure was in a dangerous and even critical condition. But due to traffic conditions and other factors involved, it was decided that closing the structure during repairs would bring about an unreasonable inconvenience and economic loss to the public. The plans and specifications were therefore made up so that one-half of the roadway would remain open for traffic at all times.

Studies were prepared for doing the various operations by riveting as well as by welding. But the engineer in charge finally decided upon the welding system. It was apparent that if riveted construction were used, it would be necessary at frequent intervals to close off more than one-half the roadway to remove or strengthen a member or portion of the structure.

Some idea of the size of the job can be obtained from the following table of the amount and value of the work.

Items	Material Used (Structural Steel)	Unit Price Bid
Towers	153,296 lbs.	$0.54
Fasciae	17,034 lbs.	0.65
Stairs	1,400 lbs.	0.50
Expansion joints	38,065 lbs.	0.28
Brackets	64,883 lbs.	0.10
Floor beams	47,144 lbs.	0.30
Trusses	21,723 lbs.	0.25
Miscellaneous	7,312 lbs.	0.60
Hand Rail		
Remove existing rail	7,939.22 ft.	$2.15
Replace existing hand rail	8.00 ft.	20.00
Repaint existing hand rail	84.65 ft.	0.25
New hand rail	7,838.24 ft.	11.00
New posts	514.00	20.00

This represents an actual outlay of money by the city of $249,401.71, which was some $30,000 above the engineer's estimate. The amount actually paid in the first group is reasonably close to the estimated figure. But in the second group, certain defects showed up after the railing was removed which were not apparent beforehand. When the condition of the rail was found to be so bad that it could not be re-used as originally planned, new railing was ordered; this made the total amount of new railing much larger than originally planned.

Repair of Towers

There are 44 towers in the viaduct. However, it was not necessary to make repairs to all of them. Only those showing deterioration which made their safety questionable were strengthened. The columns are made up of plates and angles on three sides and lattice bars on the fourth side. The plates, especially the ones facing out, were badly corroded.

The method adopted for making repairs was to install plain plates on the sides and front. These were welded to the original sections along the sides, and plug-welded 12 inches on centers. On those tower posts which showed the greatest corrosion, cover or protection plates were added. These were welded to the member and plug-welded to the heads of the rivets.

Let us compare this method with a scheme of making repairs by riveting the plates to replace the corroded portions of the member. Starting with the front plate, it would be necessary to remove all the rivets in this piece, and the connection between the plate and

(Continued on next page)

Rivets vs. welds is an argument that bobs up whenever the design of structural members is discussed. Its only real solution, of course, lies on the drafting table in actual design and computation for each individual job—and in consideration of the special factors involved. We present here a description of a major bridge-repair project on which the engineer in charge decided to use welding methods throughout. The original report received one of the awards in the 1947 James F. Lincoln Arc Welding Foundation "Design-For-Progress" Program.

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An improved feature that provides many important advantages.

It has been relocated from tail stock to engine, thus adding extra protection to clutch lever and providing other advantages.

Transmission is lubricated independently from the Automatic Chain Lubricator—thus a wider variety of lubricants are suitable for oiling the chain.

The cam-operated pump develops positive pressure with each turn of sprocket . . . and applies it automatically, in any desired volume, all the way to point of outlet. Flow shuts off, the instant clutch is disengaged. Pressure prevents saw dust and other foreign matter from working into oil line and clogging it.

Flow of oil is constant for any position encountered in felling and bucking.

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the front angles. The new plate would then have to be punched, placed, bolted, and riveted. With the side plates it would again be necessary to cut out all the rivets, support one of the angles, and then go through the same operations as for the first plate.

This point about the riveting method should also be brought out: that when the side plates are being removed—especially the inside plate—the diagonal bracing must be supported as well as the back angles. Also, when the plate is removed, the structural value of the tower is materially reduced, and when the new plate is added, the member is brought back to its original strength. Using the welding method, the portion of the original material is left undisturbed, and the new material increases the strength of the member.

Specifications were prepared consisting of an outline of the methods which would have been necessary to follow if the work had been done by riveting. The price quoted by two reliable contractors was 64 cents and 70 cents, or an average of 67 cents per pound. This is to be compared to 54 cents for welding, or a difference of 13 cents per pound. The total amount of material placed was 153,296 pounds, which at a 13-cent differential amounts to a direct saving of almost $19,928.48. Also, the plates added were smaller than would have been necessary if they had been put on with rivets. It was computed that for every 57 pounds of steel placed on the towers, an additional 32 pounds would have been required if the work had been done by riveting.

Referring again to the amount of material used in the tower, and taking into consideration the difference of the 32 pounds, we derive a saving of 86,000 pounds of material:

$$\frac{153{,}300}{57} \times 32 = 86{,}000$$

Again referring to the unit figure for riveted construction, we find that 86,000 × 67 cents gives a substantial saving of $57,620. Even if the contract price of 54 cents had been equaled by the riveting contractors, there would still have been a saving of 86,000 × 54 or $46,440, which is also a worth-while amount to save. Therefore, the total saving on the tower items is the sum of the two figures: $19,928.48 plus $46,440 or a total of $66,368.48.

Sidewalk Brackets

There are 800 sidewalk brackets in this structure. It is easy to see that any slight saving that can be effected, when multiplied by this figure, will amount to a substantial saving. Inspection revealed the various portions of the brackets which were weak and needed strengthening or repair.

If a small section was badly corroded, but could be brought to full strength by the addition of a plate, this plate was inserted by welding. In cases where larger portions of the member were corroded, an angle or plate was ordered and placed according to a method which did not call for the removal of any part of a member or for the support of the sidewalk. By following this method, no material had to be removed to install the new metal.

The installation was made by cutting off a small corner, raising the metal into place, and tack welding. The final weld was then made. The only scaffolding required was that necessary to support two men, instead of a full riveting crew. In some cases where the angle irons were so badly corroded in one spot as to require replacement, the actual repairs were made by burning out the bad section, inserting a new piece, and then welding it into place.

The greatest percentage of saving resulted when a portion of a member was corroded and replacement was made by welding in a small part of the member. Should such a member have had to be replaced in total because of riveted connections, the amount of metal used would have been large. For example: one angle was corroded badly enough in one spot to require replacement. Actual repairs were made by burning out the bad section, inserting a new piece, and welding it into place. Some of these sections were about 18 inches long for both angles. This means that by the welding method two pieces of 4 × 4 × ⅜-inch angle, 1½ feet long, were required — representing 28.4 pounds of metal. In riveted construction it would have been necessary to remove the two angles and replace them — representing a weight of 210.7 pounds, or almost ten times as much metal.

Allowing for all the variations, it can easily be said that the amount of metal used for the bracket repairs would have been doubled if riveted construction had been used. The total weight of material actually placed in the work completed on the brackets, in welded construction, was 64,880 pounds. This represents, therefore, the amount of metal saved. If this is figured at the bid price of 10 cents per pound, it will represent a saving of some $6,488.

The work involved if riveted construction had been used would have included: (1) supporting the sidewalk slab, (2) removing fasciae and providing support, (3) removing the member to be replaced, and (4) inserting a new member and driving all rivets. To do all this work, with 200 to 600 pounds of material involved in each bracket, would make the unit price run about 25 to 40 cents per pound. The real saving should therefore be taken as the total amount of metal required for riveted construction, 64,880 pounds, at an average of 30 cents a pound, or a total of $19,464. To this should be added the increased cost of the original weight of metal at a price of 30 cents minus 10 cents a pound, or a total saving of 64,880 × 20, or $12,976. Combining the two, the total is then $32,440. The total saving for the bracket item is this plus the previous $6,488, or $38,928.

Hand Rails

The original railing had been fabri-

(*Concluded on next page*)

The same

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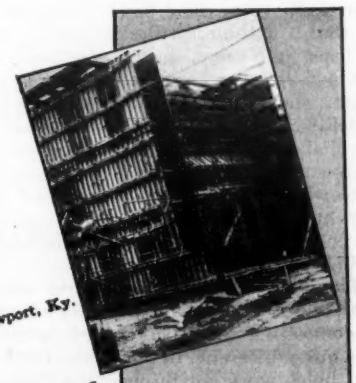
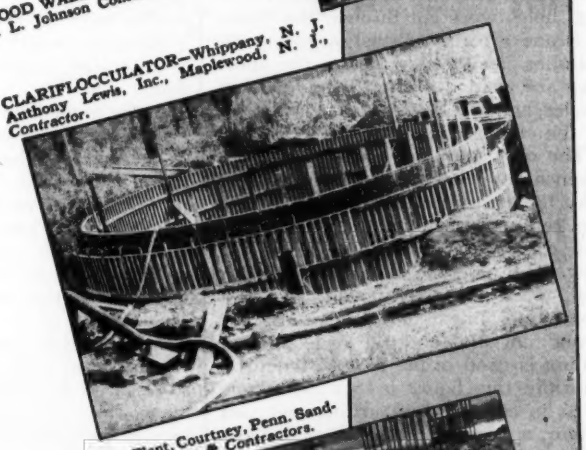


FLOOD WALL GATEWAY—Newport, Ky. W. L. Johnson Construction Co.



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(*Continued from preceding page*)

cated in a blacksmith shop, and replacements or repairs were extremely expensive. Since there had been no way to replace damaged sections, wire cables had been used for repairs to such an extent that the various portions of the bridge looked like a spider web.

The top rail consisted of a steel gas pipe and a channel iron with the flanges turned up. This permitted water and other liquids to collect between the pipe and the top channel, on top of the center channel between the spindles, and in the bottom channel. Corrosion progressed rapidly and made the railing unsightly and dangerous in a very short time after it was placed in service. This type of construction also made repairs difficult and expensive.

The new railing consists of a wrought-iron pipe and angle which has one leg turned down to avoid pocketing water or other liquids. The present type corrects the situation in reference to corrosion, as far as possible, and it is estimated that it will outlast the old railing by at least four times. In the new welded railing, there are no pockets to collect water, and all recesses can be easily and quickly cleaned. When a section is damaged, it is burned out, and a new section can be readily assembled, placed, and welded. The old design had a weight of 31.34 pounds per linear foot, while the new design has a weight of 49.071.

The spindles in both old and new are ¾-inch square bars, but the method of connecting these bars in the railing was quite different. In the original railing, holes were cut through the channels and a collar of steel forged to the spindles. In the new design the spindles are welded to the top and bottom angles, and a 2 × ½-inch bar is welded to the center of the spindle.

The only way of evaluating the difference between the two railings is to take the estimated cost of constructing the railing according to the old type and compare it with the cost of the new. The old type cost $11 per linear foot or 37 cents per pound; the new cost $9 per linear foot or 18 cents per pound. A total of 7,940 linear feet of railing is used in the bridge structure. Multiply this figure by the difference of $2 in cost of construction, and you obtain a saving of $15,880. If this railing has a life double that of the old railing, there is an ultimate saving to the city of 7,940 × $9.00, or $71,460, which is not taken into account in this paper even though it is a real saving.

Miscellaneous Items

It would be a laborious task to pick out each member and show the direct advantages of welded over riveted construction, and it would serve no direct purpose. It can be said that the saving in materials was equal to that in the towers and in many cases greater. However, one more feature will bear out the argument and will also serve to point out an interesting example of the use of welding in repairs.

The trusses over the railroad are of the Warren type. When the concrete sidewalks were removed, it was seen that the diagonals were so badly corroded that practically no area of steel was left to carry the loads. The method of making the repairs was first to remove enough concrete from one angle to expose its inside to view. A 3 × ¾-inch bar was then welded to each leg. Each angle was so treated.

Next, the concrete was removed from the top side of the center plate, and a new ¾-inch plate was welded to the angles on either side and to the center plate. These were placed in such a way as to carry as much stress as possible. Width of the plate is the same as that of the outstanding legs on the angles—plus 1 inch. This plate was welded to the angles above and below the corroded point. Then the temporary bars were burned off the angles, one angle at a time; the angles were cut out; and a new section was inserted and welded to the angle. This process was continued until all the angles were replaced. Finally a new plate of the width between the angles was welded to the underside of the center plate.

In the immediate vicinity of the corroded section there is now more metal in the new member than in the original member. But if repairs had been made by the riveted method, the entire member would have had to be replaced and the bridge supported during the operation. Traffic would not have been able to use the structure during the replacement of the member, and the railroads would have had to release one operating track to permit the construction of temporary bents. The way the work was done, there was no interference with street or railroad traffic.

These amounts of material were used: in the fasciae, 17,034 pounds; in the trusses, 21,723 pounds; and miscellaneous, 7,312 pounds; or a total of 46,069 pounds at an estimated saving of 10 cents a pound. This shows a total saving of $4,606.90, which represents the saving based on unit price alone. It was computed that throughout the bridge there was a saving in the weight of material required of about 25 per cent—which in this case amounts to 12,500 pounds. Computed at a cost of 55 cents per pound, this shows a saving of $6,875. Therefore, the total amount saved equals $11,481.90, which represents the saving in these miscellaneous items.

Conclusion

An attempt has been made to include sufficient data to show the relative economy involved in welded over riveted construction. The savings indicated for the various items are:

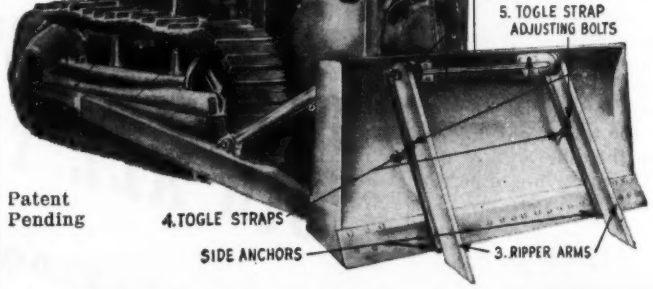
Towers	$66,386.48
Brackets	38,928.00
Hand rail	90,880.00
Miscellaneous items	11,481.90
	$207,676.38

It is hard to evaluate the benefit to the public which was gained by not interfering with its use of the structure, and it is next to impossible to put it into dollars and cents. The figure given, therefore, represents only the actual saving in materials and labor.

There is little claim for originality about this work because it has been done many times. However, the method used in putting the hand-rail members together is both new and very satisfactory.

Midwest Dealer for Darex

John Williamson has been named a distributor for Darex air-entraining agent by the Dewey & Almy Chemical Co., Cambridge, Mass. Mr. Williamson will operate his own company known as J-W Materials, Inc., located in Napoleon, Ohio. He succeeds the Cement Products Division of the Cataphote Corp. as distributor for this product in the lower peninsula of Michigan, and the states of Ohio, Indiana, Kentucky, Tennessee, Alabama, Mississippi, and Florida.



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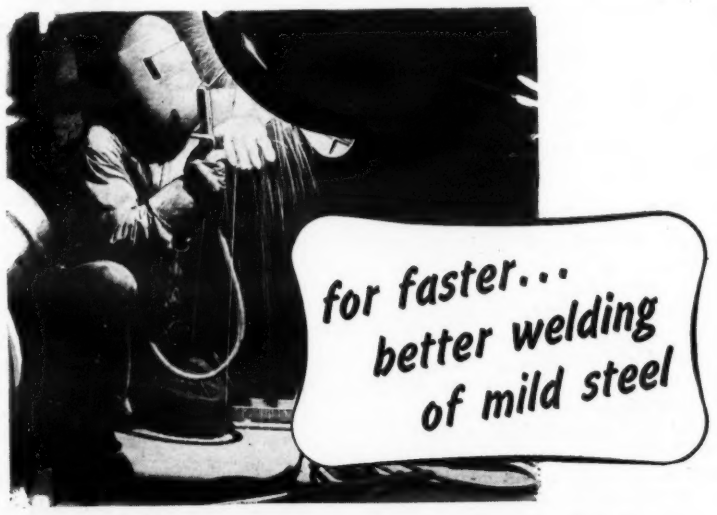

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Northern Michigan County Solves Winter Maintenance Problem With Large Fleet Of Equipment; Repair Shop

+ SCHOOLCRAFT County in Michigan's Upper Peninsula experienced 124 inches of snow during 1946-47. Ten feet of snow a season in this northern section of the Wolverine State is nothing unusual, and keeping the roads open for traffic has become a routine problem, year after year, for the agencies responsible for the work. In 1944 the Schoolcraft County Road Commission assumed maintenance of state roads within the county as well as its own county roads. Now the County plows 144.5 miles of state trunk lines, and about 400 miles of the 450 miles of roads on its county system.

To handle this winter maintenance, the Road Commission has a fleet of 29 trucks of various makes and sizes equipped with either V or one-way straight-blade plows. The state trunk lines have the priority in plowing, and the snow is cleared from their pavements first, beginning with U. S. 2 which traverses the southern part of the county from east to west. Then come the other state highways—77, 94, 149, and 219. U. S. 2 is a concrete pavement, while the others are either gravel or black-top surface.

With the present fleet of equipment, the County forces usually plow their own roads simultaneously with the state roads. The plow-trucks work 24 hours a day until the snow ceases to fall and the roads are open. Each truck has an assigned run averaging 15 miles, with a few sections in the logging area of the county covering up to 28 miles. The individual plow-truck is responsible for keeping open its section of road.

After the roads are plowed, the county forces also clear driveways leading back to farmhouses. A charge is made for this snow removal at the annual rate of $7 for the first 300 feet of driveway, and $2 more for each additional 100 feet or fraction thereof. Payment for this plowing on private land is always made in advance of the snow season. Last year the Road Commission cleared 100 driveways; the longest of these was 1,600 feet to reach a farmhouse that far back from a county road. The width opened up for these driveways is at least 12 feet.

County Characteristics

Schoolcraft County is sparsely populated, as Michigan counties go, with 9,524 residents according to the 1940 census. Of this number 5,399 live in Manistique, the county seat, which is a port on the northern shore of Lake Michigan. The Lake is the southern boundary of the county which has an area of 1,207 square miles. The rolling topography of the county is fairly well covered with forests—indeed, lumbering is its principal industry. Farming is pretty much confined to the south, as the northern half of the county is characterized by either a sand or muck soil, and dotted with numerous small lakes which make it a good hunting and fishing region.

Lying within the county boundaries are portions of the Hiawatha National Forest and the Seney Federal Migratory Waterfowl Project Area. On the shores of Indian Lake are the Kitchitikipi or Big Springs, a well known summer resort.

The eight townships comprising the county are tied together by a county road system of 450 miles classified as follows:

Dirt	210 miles
Gravel	176 miles
Black-top	64 miles

Of the black-top, 9 miles are a road-mix, while the rest consist of a tar and stone-chip seal coat. The county roads are from 16 to 22 feet wide, and they average 18 to 20 feet. They are usually constructed on a 66-foot right-of-way.

In the southern part of the county, gravel is plentiful enough, and is obtained either from three county-owned pits or from commercial sources. In the north, gravel is scarce and usually has to be hauled an average of 25 miles to maintain the roads. The pit gravel is generally rather large in size, and is usually run through the County's Cedarapids Junior Tandem 10 x 30 crusher which is set up in the pit being worked. After being reduced to a ⅝-inch size, the gravel is loaded into trucks by a loading belt that is part of the crusher. Then it is hauled to the road under repair, and end-dumped over the surface. A couple of Austin-Western motor graders are available for spreading

(Continued on next page)

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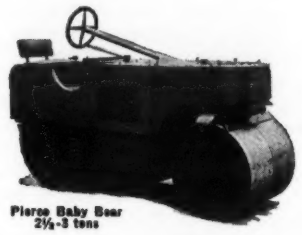

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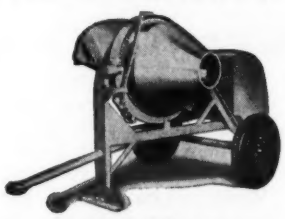

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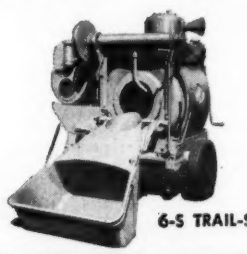

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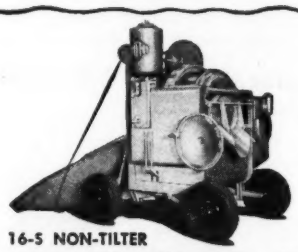

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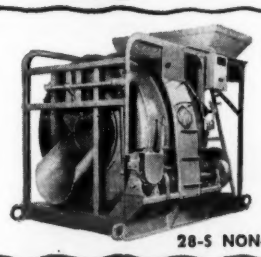

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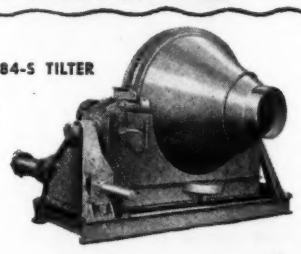

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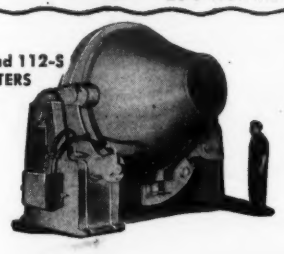

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(Continued from preceding page)

the material where it is required.

During the war and up to the present time, the roads have been maintained but they have not been improved. Nor have any higher types of road been constructed despite the increasing demand for stronger and more permanent surfaces on county roads. In the northern part of the county a 1½-mile stretch of new road was built on the berry-sand type of construction. This was a low-cost project, and while it made a fairly smooth surface for cars it was too light to be used by trucks. The road was built by having motor graders blade down the blueberry bushes over the line, and then spread sand on top of the flattened brush. The light corduroy construction knit together as it was compacted by the rubber-tired traffic.

Road Commission Organization

The three County Road Commissioners who direct the highway activities of Schoolcraft County are appointed by the County Board of Supervisors made up of 13 elected officials. One supervisor represents each of the eight townships, while the other five represent the city of Manistique where lives the majority of the population. The County Road Commissioners are appointed to a 6-year term, with the appointments staggered so that a new commissioner takes office every two years. The present board is composed of Chairman Charles H. Howard, Henry Orschel, and Harold McNamara. Superintendent of the Road Commission is A. J. Ackerman who has held this appointive post for the past five years. He began working for the County 15 years ago as a shovel operator.

In 1946 the receipts of the Road Commission totaled $197,000. The largest single item, $93,301.66, came from the State and was allocated for state maintenance. The County also received additional state funds for snow removal under a plan whereby the State grants extra allotments to counties where the annual snowfall is 60 inches or over. The fund is pro-rated on the basis of inch-miles of snowfall over 60 inches on state highways within the respective counties. Other principal sources of revenue are funds from the gasoline and weight tax.

Lack of money and materials during the past year was responsible for the limited improvements on the road system. The Commission has a total of 51 year-round employees, and because of the increased cost of living, a general wage increase of 15 cents an hour was put in effect. The employees work a 9-hour day, 5 days a week, with time and a half for holiday work. The shortage of materials was also keenly felt. Road tar was difficult to obtain as was calcium chloride. The non-surfaced roads that are treated with calcium chloride usually get three applications a year during the summer months. Each treatment requires 2 tons of calcium chloride to the mile.

Some appreciable reductions were effected in shop repairs with the purchase of a few pieces of new equipment. The Commission feels that greater savings will result when more of the old and obsolete equipment is replaced with new machines. The savings, in turn, can be applied to increased maintenance service. But more financial help is needed to purchase new and additional equipment and road material to meet the growing demand for higher types of roads.

In the meantime, most of the road work consists of regular maintenance such as plowing, sanding, dragging, patching, mowing, and repairing bridges and culverts. On the state system are 32 roadside tables; the county forces keep these in pleasing shape and empty the refuse barrels at regular intervals.

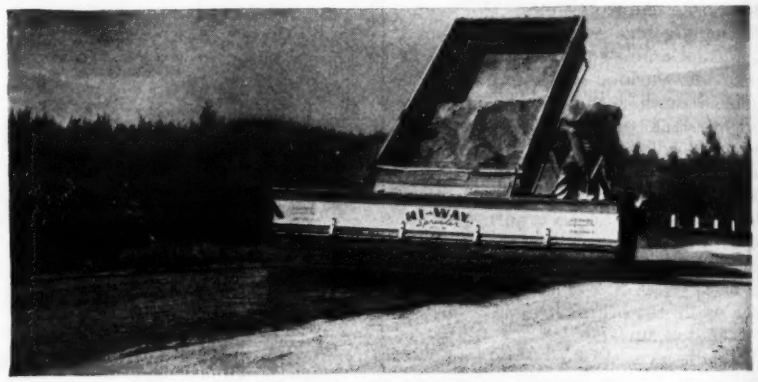
Equipment Repairs

The Road Commission headquarters are in an old red-brick building, a converted tannery, located on a 14-acre site in the northeast part of Manistique. The building is a 2-story structure, 200 feet long x 50 feet wide, which houses the equipment repair shop where the larger units are stored and major repairs are made. The Commission also has a smaller garage at Seney and a storage shed at Germfask in the north half of the county. In time, the Schoolcraft authorities hope to build a new and modern shop-office-garage for their headquarters.

Equipment enters the Manistique garage through 18-foot-wide x 14-foot-high sliding wooden doors opening in the north and east walls. Inside, the concrete floor supports a 4-column row of concrete posts down the middle of the building on which rest steel I-beams which take the load of the second floor. Two rows of electric lights hang from the ceiling to augment the natural lighting which comes from the windows along the west wall. Fire-fighting apparatus in the building consists of three hose lines connected to the city hydrants, as well as 36 fire extinguishers scattered about the shop.

Jutting out from the east wall is a 10 x 40-foot addition which houses a Weil - McLain coal - burning boiler equipped with an Iron Fireman automatic feed stoker. A system of blowers and radiators heats the building. Another addition, 18 x 40 feet, in the east

(Continued on next page)



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1 Crack Filling—there's a Pouring Pot Outlet on the No. 101 Utility Spray Tank for this kind of work, no need to have special equipment for this type of maintenance, when you get it as part of this utility unit.

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Utility is the word for it. Three jobs in Road, Street or Highway maintenance done with one unit—the Littleford No. 101 Utility Spray Tank. Why purchase a separate unit to do each job, when all three jobs can be done with one? Here is a packaged piece of equipment containing **utility**; made in sizes from 400 to 1000 gallon. Get more details by writing for Bulletin No. 5.

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Put more profits into your pockets by saving time and material. Shift one lever and you can operate the Model R Spreader forward or backwards to suit the job. Spiral feed roller and agitator-conveyor have reversible transmissions assuring positive action and steady flow of material regardless of direction. Feed gate adjustment controls thickness of spread. Width can be adjusted from one foot to full width of spreader. Entire unit is balanced for easy hook-up to truck. Swivel type self-coupling hitch allows traction wheels to remain in constant contact with ground...assures even distribution on any job. Hi-Way Model R Material Spreaders are available in 8, 9, 10, 11, 12, and 13 foot widths. Write for complete details.

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This remarkable spreader clamps onto tailgate of any dump truck. Permits one man to cast a uniform spread 8 to 60 feet wide at truck speeds up to 35 miles per hour. The DD casts material close to ground under and ahead of rear wheels of truck. It is equipped with adjustable feed gates controlling thickness and direction of spread, and throttle on 1½ H. P. Briggs & Stratton gasoline engine to control width. Material feeds into hopper by gravity—no shoveling required. The Model DD is widely used for low cost seal coat work, for spreading calcium chloride on gravel and dirt roads for dust control in summer, and for spreading sand and cinders on highways, streets, and airports for ice control in winter. Write for specifications.

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MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

C. & E. M. Photo
Schoolcraft County Road Commission headquarters are in this 2-story red-brick building in Manistique—a converted tannery. You are looking at the northwest corner of the garage. Upstairs are offices, a recreation room, and storage space.

wall near the south end of the building is divided into three separate rooms. Two of these, measuring 10 x 18 feet each, consist of a locker room and compressor room respectively. In the latter is kept a U. S. air compressor which supplies the workbenches with compressed air. Some lubricating oil is also stored in the compressor room. The third room making up the lean-to is 18 x 20 feet and contains a G-E Tungar battery charger which can handle six batteries at a time. The room also holds a Kwik-Way valve-grinding machine.

Truck Storage

The main part of the building is practically all given over to the storage of trucks. As a mute reminder of the long winter and accompanying snow, row upon row of tire chains for the trucks hang along the walls. They are installed quickly with the aid of a couple of Walker 10-ton floor jacks. The equipment is lubricated with an Aro grease unit.

Across the south end of the garage stretches a wooden workbench to which are fastened four 6-inch bench vises. Also mounted on the bench are a Black & Decker 7-inch grinder, an AC spark-plug cleaner, and a Black & Decker ⅜-inch electric drill.

Bolts of all sizes are readily selected from a shop-made storage rack which consists of 10 circular trays ranging in size from 8 to 26 inches in diameter. The metal trays are supported within a tripod made of 2-inch strap steel, with the smallest tray at the top and the largest at the bottom.

Suspended from the ceiling at the south end of the garage is an overhead rail on which run a Yale 1-ton and three Yale 2-ton hoists. The rail continues up the west side of the main building and enters a 22 x 20-foot wing which juts out of the west wall and serves as a machine shop.

Machine Shop

A 16-foot-wide door connects the garage with the machine shop. It could be a lot larger to accommodate more comfortably the equipment that it contains. A 3-foot door in the west wall leads to the outside, while just to the north of the door and before a window is a Sidney lathe with a 16-inch swing and an 8-foot bed. Across the north wall stock steel is kept. South of the door along the west wall, and in front of another window, are a Champion 22-inch drill press and a Manley 25-ton mechanical press.

Built into the east wall, separating the shop from the rest of the garage, is a cabinet for bolts and nuts, with access possible from both sides. Welding is done on a steel worktable with a P&H electric arc welder which has a range of from 30 to 285 amperes, or with an oxyacetylene unit. Near-by is a 3-foot-square forge and a 200-pound anvil, together with a 10 x 3-foot wooden workbench containing a 6-inch vise.

Clustered about in the south end of the shop are a Sioux 10-inch heavy-duty grinder; a 3 x 18-inch power grinder; a Marvel 18-inch power hack saw; and a Cincinnati 12-inch grinder. Small tool parts are kept in a cabinet in the southwest corner of the room.

Second Story

At one end of the second floor of the main building are located the following: the room where the Commissioners meet, the Superintendent's headquarters, and an office for the clerks. The rest of the upper story, with the exception of a 25 x 50-foot walled-off room, is devoted to storage. Here are kept such miscellaneous items as extra tire chains, plow parts, small tools, tires, paint, road signs, etc. Repair parts are stored in wooden bins and on shelves built along the walls. Drums of alcohol to serve as anti-freeze in radiators are held here until needed. About 300 gallons of alcohol are used every year for this purpose.

The enclosed portion of this floor with Celotex walls and ceiling is fitted up as a recreation room for the employees of the Road Commission. Only the Celotex paneling and the fluorescent lights were purchased; all the rest of the furnishings and equipment have been donated by the various employees. The donations included chairs, tables, dishes, gas range, dart board, piano, and bar. Here the employees can have a social evening or beer party, either stag or with their wives or "girl friends".

The Grounds

Other buildings at the site besides the main shop are a 20 x 35-foot red-brick structure where signs are made and painted either by hand or with De Vilbiss spray guns; and a small 8 x 10-foot shed where dynamite is stored. The dynamite is used for blasting out rock where ditches are being deepened. The shed is at some distance from the other buildings in the interest of safety. Also on the property is a wooden frame house, owned by the County, where one of the mechanics lives so that a trained man will always be available at

(Continued on next page)

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IT'S the fast action in handling the batch before, between and after mixing time that means high paver production.

Look over the MultiFoote Duo Mix! The skip is wide—you don't have to *fit* the truck into it! Skip action is fast. The material is in the first drum in a hurry. The *transfer* is of the rotary type — a quarter-turn and the material starts into the second drum — fast action here, too. It takes only a quarter-turn to open the *discharge* and the batch is in the bucket. Everything from controls to dumping the bucket is designed to clip seconds from the mixing cycle. It's a record maker.

See the Duo Mix (Double Drum) MultiFoote 34-E Paver. Talk to owners. You'll find its dependability, simplicity and speed will mean increased profits on your contracts.

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MULTIFOOTE
CONCRETE PAVERS
BLACK TOP PAVERS • FOOTE KINETIC MIXERS

(Also see page 62)

Plow-Trucks Keep Roads Snow-Free

(Continued from preceding page)

any hour of the night to work on the equipment should the occasion arise.

Outside the shop is a grinder where the blades on the mowing machines are sharpened. Gas pumps are mounted on a slab of concrete that once served as a machine block for the tannery. The spacious grounds around the shop are grass-covered except for the gravel yard and the gravel road encircling the building. On the grounds are stored the big snow plows and 25 miles of snow fence. The fence starts going up the middle of October and is left in place for half the year, or until the middle of April, for April snow storms are not uncommon in Schoolcraft County. When the fence is dismantled it is stored in near-by barns if possible, or else brought back to the shop yard. In the spring when the snow plows are no longer needed, they are taken from the trucks, given a coat of paint to prevent rusting, and left in the yard until they are called into service the following winter.

Running along the north property line are the tracks of the Minneapolis, St. Paul & Sault Ste. Marie RR. Another essential piece of equipment around the grounds is a trailer which will house four to six workers. The crew members live and eat in the trailer when they are sent to the northern part of the county on a gravel-crushing assignment.

Equipment List

As mentioned previously, the Road Commission has a fleet of 29 trucks equipped with plows that it can throw into a snow fight. They include the following:

5 Ford 1½-ton
7 International 2-ton
3 International 3-ton
1 FWD 3-ton
12 FWD 6 to 8-ton
1 Oshkosh 10-ton

The different plows that can be attached to the trucks include:

8 Ross V-plows
3 Baker V-plows
1 Sargent V-plow
5 Wisconsin V-plows
1 Frink V-plow
9 Ross 1-way plows
2 Baker 1-way plows

Other snow-removal equipment includes a Frink hydraulic 12-foot snow wing and 2 Snogo rotary plows. The latter are usually employed in conjunction with the one-way or wing plows which pull the snow in for the Snogos to pick up and throw out beyond the ditch line.

Other equipment that the County maintains, not already mentioned, includes the following:

3 passenger cars
3 pick-up trucks
2 Sterling 1,600-gallon water-tank trucks
1 International 700-gallon water-tank truck
1 Duplex 7½-ton truck with underbody scraper
2 International TD-40 tractors
1 Caterpillar Sixty tractor
1 International mowing machine
2 McCormick mowing machines
1 Jari power mowing machine
1 Seaman Pulvi-Mixer
3 Austin-Western pull graders
1 Burch multi-blade maintainer
1 Burch 8-foot berm maintainer
1 Gledhill road shaper
1 Barber-Greene bucket loader
1 Oliver chloride spreader
1 Littleford portable roller
3 Austin-Western 3-wheel 10-ton rollers
1 Jaeger 7-S mixer
1 Barco gas hammer
2 White tar heaters
1 steam boiler
1 Chausse portable bituminous heater
1 Fruehauf 6-wheel trailer
1 2-wheel trailer
1 4-wheel trailer
2 Burch sand spreaders, motor-driven
7 sand spreaders, spinner type
1 Good Roads sand spreader, spinner type

Snow Removal

All the snow removal in Schoolcraft County is done solely by county forces and county equipment without the hiring of any extra trucks. As a preliminary move, the bodies are usually removed from the trucks to prevent their accumulating a load of snow during a storm. Tool boxes are fastened to the chassis instead and contain extra chains, tow cables, hand shovels, etc. When plowing is under way, it continues on a 24-hour schedule until the roads are open. The operators work two 12-hour shifts from 6:30 to 6:30 around the clock. On the night shift two men are assigned to a plow-truck, but one is considered sufficient on the day shift. One mechanic is always on duty at the shop throughout the night to handle repairs and to keep the trucks rolling.

The state trunk lines are usually kept open with the one-way plows mounted on the lighter, faster trucks. During the storm the main effort is concentrated on plowing the width of the pavement. When the snow ceases to fall the plows come back, and working with the Snogos they clear the state roads from ditch line to ditch line. The heavier V-plows are employed mainly on the county roads where the snowfall may have accumulated to a greater depth than on the state roads.

Sanding the roads is also considered an important step in winter maintenance. Sand dunes along the northern shore of Lake Michigan provide an ample quantity of sand for the stock-

(Concluded on next page)

MARVEL CONCRETE VIBRATORS

also

Asphalt and Tar Kettles
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Super Service
ON ALL TYPES OF JOBS!

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Every UNIT is FULLY CONVERTIBLE

Regardless of whether your job calls for a shovel, clamshell, magnet, dragline, trenchoe, grapple or backfiller, a UNIT machine easily "fills the bill"! For UNIT is convertible to ANY attachment and gives an excellent account of itself on ALL types of service. The change from one attachment to the other can easily and quickly be made on the job, by any ordinary mechanic. UNIT exclusive features include: Automatic traction brakes... Disc type clutches... One-piece cast gear case and above all, UNIT's safety promoting FULL VISION CAB.

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UNIT CRANE & SHOVEL CORP. 6309 WEST BURNHAM STREET MILWAUKEE 14, WIS., U.S.A.

piles of 1,500 to 2,000 yards which are stored in the shop yard. Calcium chloride is mixed in with the sand to prevent the mass from freezing up solid. The sand is dug out with a crane or shovel, loaded into the light, fast trucks, and scattered over the icy roads by means of sand spreaders which are hooked to the backs of the trucks. The sanding is done first on the hills, curves, at crossings, and then on the straightaways.

In the city of Manistique where the snow is sometimes plowed up into huge banks, a Snogo is pressed into service to clear the streets. The machine is fitted out with a hydraulically operated loader that transfers the hard-packed snow from the streets to the trucks which haul it away to the dump.

Albert Julius Ackerman, the County Superintendent, a big hunk of man who stands 6 feet 4½ inches and weighs 265 pounds, and who operates a plow himself during a storm if needed, reports that the Road Commission receives no complaints about the highways not being kept open during a severe snow storm.

"We can't say the same about the driveways, though", he admitted. "People seem to expect us to clear their driveways before we even plow the road in front of their places. Then we have trouble with kids calling us up and saying that someone in the family is sick and that we got to plow out the driveway so that they can get the doctor. It usually develops that some young fellow wants to get out to see his girl. If a doctor has to make a call, we always see that he reaches his patient.

"During one storm a man kept calling that his wife was going to have a baby, and we plowed his driveway three times a day so that when the doctor came he would have no trouble reaching the house. We kept that drive as clean as a state trunk line, but the doctor didn't come until the following August when the baby was finally born. They don't fool us anymore with that story. Now we check with the doc and get a line on the delivery date. However there do seem to be more babies born during these winter snow storms that at other times of the year. Sort of keeps us on our toes to see that the stork makes the proper connection."

Heavy-Duty Diesels Develop 191, 103 Hp

Two new 6-cylinder diesel engines are in production, announces the Industrial Power Division of the International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill. Model UD-24 has a 1,090-cubic-inch displacement and a 5¾ x 7-inch bore and stroke. It is said to develop 191 hp at 1,375 rpm, while the UD-24 power unit, equipped with radiator, fan, clutch, and power take-off, develops 180 hp at 1,375 rpm. The UD-16 has a 501-cubic-inch piston displacement, and a 4.4 x 5.5-inch bore and stroke. It is said to develop 103 hp at 1,800 rpm as an engine; and when equipped as a power unit, it develops 100 hp at 1,800 rpm.

The UD-24 is designed for heavy-duty operations in construction machinery, electric power plants, rock crushers, sawmills, etc. It is the same engine used to drive the International TD-24 crawler tractor. Features include: 4-cycle design, twin-plunger fuel-injection pump, close-governed speed regulation, superior lugging ability, minimum consumption of low-cost fuels such as No. 3 fuel oil; and exhaust and intake manifolds located on opposite sides of the engine. Use of ordinary lubricating oil without the need of oil coolers, the manufacturer says, is made possible by a forced-circulation type of cooling system, by-pass thermostatic control, large full-length water jackets, and a dual water manifold.

Other features include a Tocco-hardened crankshaft, IH single-orifice injection nozzles, seven precision tri-metal 4⅛-inch-diameter main bearings, tri-metal connecting-rod bearings, full-pressure lubrication through rifle-drilled passages, aluminum-alloy pistons, replaceable heat-treated dry cylinder sleeves, a large flywheel, valve-in-head construction, efficient engine sealing against dirt, and large oil, air, and fuel-oil filters. A 12-volt generator and electric starting motor are regular equipment.

Features of the UD-16 include: a built-in gasoline conversion starting system, hardened replaceable cylinder sleeves, precision main and connecting-rod bearings, induction-hardened bearing journals on a seven-bearing crankshaft, four-cycle valve-in-head design, full-pressure lubrication, aluminum-alloy pistons, a large flywheel, single-orifice injection nozzles, and a flyball-type of governor. Pre-combustion chambers give good variable load and speed performance on a variety of low-cost fuels. A twin-plunger injection pump is said to assure uniform fuel injection and equal power from all cylinders. As in the UD-24, cooling is attained through the use of the forced-circulation type of cooling system, by-pass thermostatic control, full-length water jackets, and a dual water manifold.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 46.

NYC Bearing-Sales Office

A sales office has been opened in New York City to specialize in anti-friction bearings. The new firm is Dalc Bearings, Inc., located at 1974 Broadway. It will distribute ball and roller bearings and anti-friction products manufactured by the SKF, Fafnir, Federal, Schatz, and Timken bearing companies, and the Bunting Brass & Bronze Co.

Used Construction Equipment Available for Immediate Delivery

1—Allis Chalmers Model "WM" gasoline burning crawler tractor, Ser. No. 11692 complete with Gar Wood Model REDX bulldozer, Ser. No. 5662. As is where is.

1—Allis Chalmers Model "WK" tractor complete with Gar Wood Hyd. bulldozer. Rebuilt & Guaranteed.

1—Allis Chalmers Model "WK" tractor complete with Baker Hyd. bulldozer. Rebuilt & Guaranteed.

1—Allis Chalmers Model HD7W Diesel tractor, Ser. No. 13212 complete with Gar Wood Hyd. bulldozer, front pump operated and Gar Wood Model 25 two wheel Hyd. scraper and independent Hyd. system. In perfect condition.

1—Allis Chalmers Model HD10W, Ser. No. 5836 Diesel tractor complete with Buckeye Double Drum Power Control unit and cable operated bulldozer. In perfect condition.

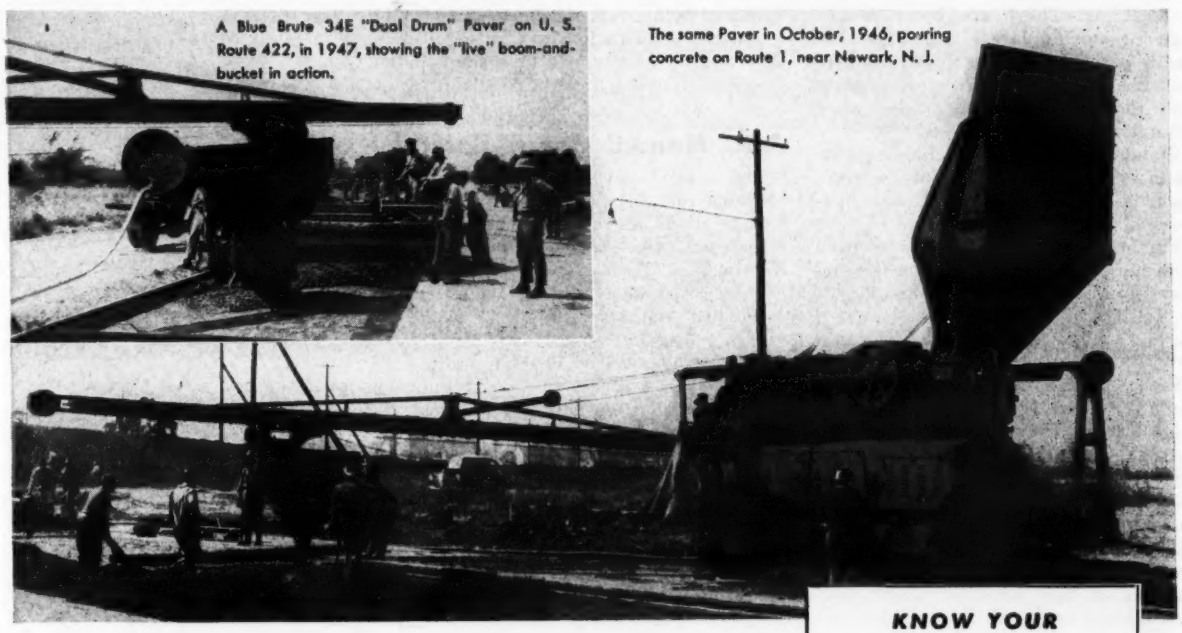
1—Caterpillar 50 Gasoline tractor in perfect operating condition.

1—Caterpillar RD7 Diesel tractor complete with Le Tourneau double drum power control unit in good operating condition.

1—Caterpillar RD7 Diesel tractor complete with adaptor for Le Tourneau Power Control unit. As is where is.

LAKESHORE MACHINERY & SUPPLY CO., 400 West Laketon Avenue, Muskegon, Michigan. Phone 2-6655

WHEN A BLUE BRUTE PAVER SET THE PACE...



A Blue Brute 34E "Dual Drum" Paver on U. S. Route 422, in 1947, showing the "live" boom-and-bucket in action.

The same Paver in October, 1946, pouring concrete on Route 1, near Newark, N. J.

No paving job moves faster than the pace set by its paver. That's why S. J. Groves & Sons Co. selected Ransome Blue Brute 34E Dual Drum Pavers for jobs where fast performance was a "must".

Speed counted on the new 3-lane U.S. 422 between New Castle, Pa., and Youngstown, Ohio, delayed by abnormally heavy rains and lack of skilled manpower. Here a Ransome Blue Brute 34E Dual Drum Paver set the remarkable pace of ½ mile per day. This was the very same Blue Brute, incidentally, that performed a rush job the year before on U. S. 1 near the Newark, N. J. Airport. Here, fast-growing traffic demanded a tremendous widening project in a hurry.

That's where the 34E's many advanced features proved themselves. For example: *the fool-proof, self-cleaning, fast-charging skip . . . mechanically operated batchmeter for all-weather accuracy . . . precision water-measuring . . . and the exclusive, hydraulically operated "live" boom-and-bucket combination that spreads as it swings, cutting down costly hand shovelling.*

Geared to the output of the Blue Brute Paver, these large-scale paving operations were carried out smoothly . . . economically . . . on time! And that's why a Ransome 34E, Single or Dual Drum, on your own construction jobs will lay more yardage . . . more accurately and with less manpower ...than any other paver. For full details, see your nearby Worthington-Ransome Distributor, or write for Bulletin 208.

RS-5

KNOW YOUR BLUE BRUTES

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

RANSOME EQUIPMENT

Pavers, Portable and Stationary Mixers, Truck Mixers, Pneumatic Placing and Grouting Equipment and Accessories.

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Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

WORTHINGTON

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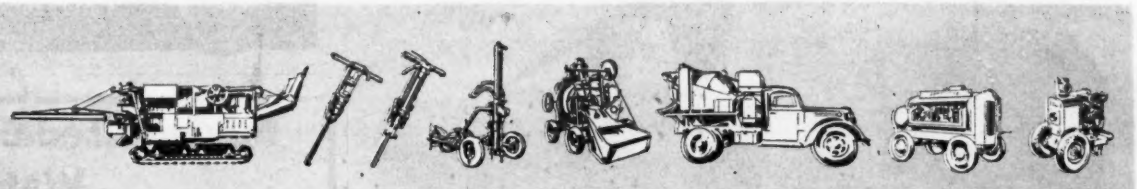
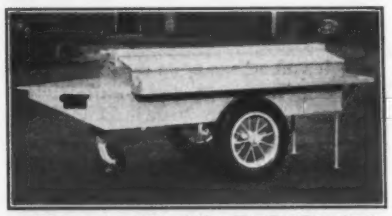
BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB



This new model of the HanDeeBox tool trailer has a patented locking cover, locking chains to keep the box from being trailed when it is left unprotected, and a safety catch to hold the covers open.

Tool-Box Trailer

A new model of its HanDeeBox, all-steel portable tool trailer has been announced by Littleford Bros., Inc., 485 E. Pearl St., Cincinnati 2, Ohio. It is mounted on two pneumatic-tired wheels, and has an extra caster wheel for moving the box on the job. When the unit is trailing, this caster wheel folds under the box. Adjustable legs at the rear of the unit give extra support and stability for operations like cutting and threading pipe.

A special safety catch is designed to hold the covers open so they will not drop on workers' hands. Sliding shelves are divided into compartments to hold first-aid kits, records, files, small tools, fittings, etc. There are brackets and lugs for storing larger tools. The box has a patented locking cover to protect the tools, and locking chains to keep the box from being trailed when left overnight or unprotected.

Standard equipment includes pneumatic tires, semi-elliptical springs, heavy steel axle, and Timken-roller-bearing wheels.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 43.

Caterpillar Staff Changes

Mark A. Clements has been named General Service Manager of the Caterpillar Tractor Co., Peoria, Ill. He succeeds D. O. Nash, who has resigned in order to join the Wortham Machinery Co., Caterpillar distributor located in Cheyenne, Wyo.

Clements' former position as Western Division Service Manager, with headquarters at San Leandro, Calif., has been taken over by J. Dean Uhll, who has been transferred from the position of Central Division Service Manager. Mr. Uhll, in turn, has been succeeded by Ellsworth M. Iverson, Service Engineer, and T. M. Fahnestock has been named Service Engineer.

E. E. Witt has been appointed Special Representative in construction and industrial sales in the Western Division. His headquarters will be in San Leandro, Calif.

Compression Tester

A new model of its Baldwin-Emery cement and concrete-testing machine has been announced by the Testing Equipment Department of The Baldwin Locomotive Works, Inc., Eddystone, Pa. A feature of this 300,000-pound-capacity unit is its ram which has a 10-inch stroke. The machine is said to meet the American Society for Testing Materials requirements. It is recommended by its manufacturer for use on construction jobs, in field laboratories, and other projects where a single-purpose machine is needed for inspection and control testing.

Available as optional equipment is a spherically seated rectangular compression head, and a bearing plate designed to permit testing of concrete blocks 12 inches wide, 18 inches long, and 8 inches high. Scribed concentric circles on the plate make it suitable for use with standard cylindrical specimens.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 18.

AGC Manual Covers Safety

The second revised edition of the "Manual of Accident Prevention in Construction" is available from the Associated General Contractors of America, Inc. This 372-page pocket-size book is designed to serve as a guide in organizing and carrying out a sound safety program.

The first 66 pages cover the organization of such a program, the role of meetings, bulletins, danger signs, the executive, the superintendent, the foreman, etc. The remaining pages cover safe practices in specific phases of construction—excavation, pile driving, form work, scaffolding, tunnels, etc.

The book is illustrated, and it is thoroughly indexed to increase its usefulness to those concerned with planning for safety on the job. It costs $2.00, and it can be obtained by writing to the AGC at the Munsey Bldg., Washington 4, D. C.

Davey Compressor Dealers

The appointment of three new dealers has been announced by the Davey Compressor Co., Kent, Ohio. C. R. Smith & Sons, Inc., Youngstown, Ohio, will cover the Ohio counties of Mahoning, Trumbull, and Columbiana, and the cities of Alliance, Ohio, and Sharon, Pa.

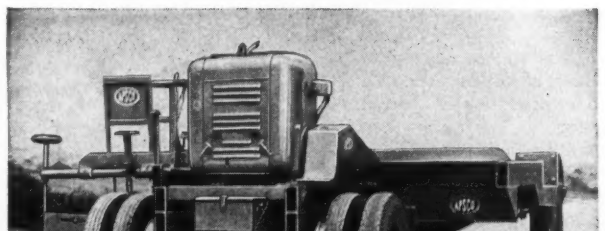
Fry Equipment Co., 525 So. 11th St., Abilene, Texas, will cover the Texas counties of Brown, Callahan, Coke, Coleman, Concho, Eastland, Fisher, Haskell, Howard, Irion, Jones, McCulloch, Mitchell, Nolan, Runnels, Scurry, Shackelford, Stephens, Sterling, Stonewall, Taylor, Throckmorton, Tom Green, Erath, Comanche, Hamilton, Mills, Borden, Dawson, Gaines, Andrews, Martin, Glasscock, Midland, Ector, Winkler, Loving, Ward, Crane, Upton, and Reagan.

Davies Equipment Co., Washington and 4th Sts., Frackville, Pa., will represent Davey in the Pennsylvania counties of Lackawanna, Wayne, Pike, Luzerne, Wyoming, Monroe, Carbon, Schuylkill, Columbia, and Montour. The company will also have non-exclusive sales rights in the counties of Sullivan, Lycoming, Northumberland, Tioga, Bradford, and Susquehanna.

ALMOST INDISPENSABLE

. . IF YOU WANT A FAST, ECONOMICAL JOB OF

ROAD WIDENING



HERE IS *THE* WIDENER, APSCO'S MODEL 80

TWO MAN CREW · POWERFULLY BUILT · HANDLES ANY AGGREGATE UP TO 6" · 2' to 8' STRIPS AND ANY DEPTH · NO RAKING OR FILL-IN REQUIRED—IN MOST CASES, NO FORMS REQUIRED · IT'S REALLY A HONEY!

Send for complete specifications!

THE ALL-PURPOSE SPREADER CO.

FULLER ROAD ELYRIA, OHIO

CUMMER TWO-FIRE DRYER and 40-TON BIN UNIT

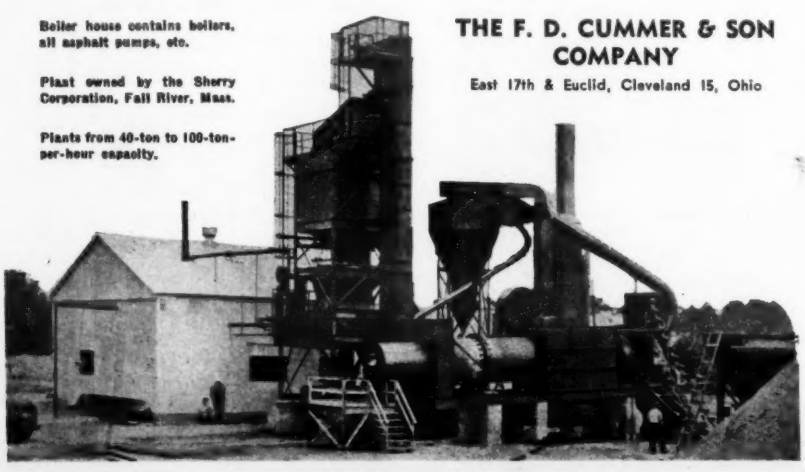
50 to 60 tons per hour capacity—located at Fall River, Mass.

Completely equipped with dust collection unit discharging into boot of hot elevator. Plant is equipped with 3-compartment cold storage hopper and feeder for regulation of feed into the dryer. 4' x 10' vibrating screen, 40-ton bin, 1-ton mixer, dial scales complete with all motors and drives.

Boiler house contains boilers, all asphalt pumps, etc.

Plant owned by the Sherry Corporation, Fall River, Mass.

Plants from 40-ton to 100-ton-per-hour capacity.



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WISCONSIN *Air-Cooled* ENGINES

Trainloads of cast iron, bar steel, sheet steel and drop forgings; thousands of Timken roller bearings, magnetos, carburetors, fuel pumps and many other parts and materials . . . including 20,000 gallons of gasoline per month simply for factory test runs . . . that's what it takes to build Wisconsin Heavy-Duty Air-Cooled Engines!

But above all this *quantity* is the *quality* that is the final product . . . the Heavy-Duty Air-Cooled Wisconsin Engines that are serving Industry so dependably, in so many ways . . . as integral power units on a great variety of equipment, delivering "Most Hp. Hours" of on-the-job power service.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 14, WISCONSIN

Buying Used Equipment?

Watch the "Trading Post"

See Page 107

Flood Experts Build New Stream Channel

Army Contractors Scoop Foundation, Pour Walls And Invert, to Advance Taming of Unruly River

(*Photos on pages 54 and 55*)

✦ ONLY ten years ago, metropolitan Los Angeles lived each winter in unholy fear of the Los Angeles River, a dinky little stream meandering through the great western city. That situation is changed today, thanks to a 10-year flood-control program by the Corps of Engineers and the Los Angeles County Flood Control District.

Since 1935, protective works along the river have advanced its control well towards the west edge of Los Angeles. And the sleepy summertime stream which rose up nearly every winter rainy season to become a raging hydraulic monster has been whipped by earth, steel, and concrete.

Today's flood-control work is still urgent. Gaps in the existing works are being closed, and new work is advancing the concrete channel west towards Sepulveda Dam near Van Nuys. Until the construction of a high-capacity concrete channel is completed, neither Sepulveda nor Hansen Dams can be operated at their designed peak of efficiency, because their discharges have to be kept as low as possible to minimize damage on the unimproved channel sections downstream. The actual taming of the river is a reality, but present and future works will be a refinement of Man's victory.

Last construction season an important contract was begun to advance the new channel 9,000 feet upstream in the vicinity of Warner Brothers picture studios south and west of Burbank. Located at River Mile 33.70 and 35.40 between Niagara Street and Lankershim Boulevard, this contract ties on to concrete channel work put in under the supervision of the same man, J. G. Morgan, who was Resident Engineer on the contract.

The new work cost about $2,800,000 for field construction. A joint venture with three principals—United Concrete Pipe Corp. of Baldwin Park, Vinnell Co., Inc. of Alhambra, and Ralph A. Bell of Long Beach—was responsible for furnishing materials and pushing the work to completion. Started April 23, 1947, the new channel section was slated to be finished by March 1, 1948, in spite of abnormally long delays on steel which slowed operations.

Flood History of River

While excavations, riprap, and flood-preventive measures of a sort date back to the time of the Spaniards, active flood control on the Los Angeles River postdates the year 1935. That year the Corps of Engineers initiated a quite extensive program, financed by PWA funds, Rivers and Harbors allocations, and flood-control tax receipts. The first channel work was built by hired labor forces, and supervised by civilian engineers under Col. Theodore Wyman, Jr. Among his other jobs, Resident Engineer J. G. Morgan of the recent United-Vinnell-Bell contract was the supervising engineer on the very job which now ties in to the lower end of the work.

Since 1940, river contracts have closed most of the gaps through downtown Los Angeles. Sepulveda Dam, an earth-fill barrier, was built in 1940-42 to trap river run-off about 40 miles above the mouth.

One of the worst floods ever to occur roared down the channel in February and March of 1938. While unprotected sections suffered severe damage, most of the newly designed work completed at that time stood Nature's toughest test and performed as planned.

Present Channel Design

United-Vinnell-Bell crews have built a channel which follows the same general plan of the initial design. It consists basically of a reinforced-concrete channel with high walls, heavy wall footings, and paved invert. Weep holes and various other inlets let the channel take on water from the adjacent ground. The main refinement on the recent job is a 12-foot low-water channel 3 feet 2 inches deep, set in the center of the main channel. Construction of this low-water channel was one of the main job problems, due to extensive ground water.

C. & E. M. Photo

Ground water constantly plagued the United-Vinnell-Bell contract in Los Angeles. Here workmen fine-grade tiny trenches to train ground water away from the subgrade of a wall-footing pour.

The inside channel width between walls is generally 130 feet, varying to 160 feet under a bridge near Warner Brothers studio. It was there, in the 1938 flood, that severe erosion tore part of the bridge away and scoured the banks to the danger point.

Wall heights vary from 14½ to 22 feet on tangent sections. Some of the curves are superelevated by as much as 1.4 feet from the channel center line to

(Continued on next page)

Does the complete Mixing and laying job

IN ONE CONTINUOUS OPERATION

The aggregate may be dumped directly from trucks into the front hopper, as shown here, or, if desired, it may be picked up from a windrow—using the H & B Moto-Loader.

Moto-Paver delivers the mixed material, spread and struck off on the road surface, ready for rolling. The strike-off blade is adjustable to hold accurately to specified grade and crown. The strike-off mechanism is supported independently on runners 25 feet in length. This insures a smooth finished surface—without waves—even when resurfacing rough or irregular pavement. The Moto-Paver has been successfully and economically operated using gravel, stone or slag aggregates—with most types of emulsions, RC, MC and SC asphalts and tars. Bulletin MP-47, giving complete information and specifications, will be sent on request.

HETHERINGTON & BERNER, INC.

731 Kentucky Ave. Indianapolis 7, Indiana

★ MOTO-PAVER MIXES, LAYS AND SPREADS ANY TYPE OF MIXED-IN-PLACE BITUMINOUS MATERIAL TO ANY SPECIFIED WIDTH, THICKNESS, GRADE AND CROWN

Flood Experts Build New Stream Channel

(Continued from preceding page)

the wall. This will increase hydraulic flow performance, and take some of the stress off the wall at the outside of the curve, during peak flows.

There are three channel-floor gradients, which range from 0.003265 to 0.007009, calculated to pitch the flow down towards the Pacific Ocean at high velocity. The big channel is designed with a Q-factor sufficient to handle 55,000 cfs with 3 feet of freeboard below the top of the walls.

Beautiful as the design is on paper, its construction has been a battle with abnormal ground water, blue silt and clay, and a few hard-rock ledges. There has been a shortage of steel, enough to upset many a schedule. A peak traffic volume of 1,400 cars per hour at the Warner Brothers studio has more than once stifled the flow of trucked-in aggregates to the batch plant.

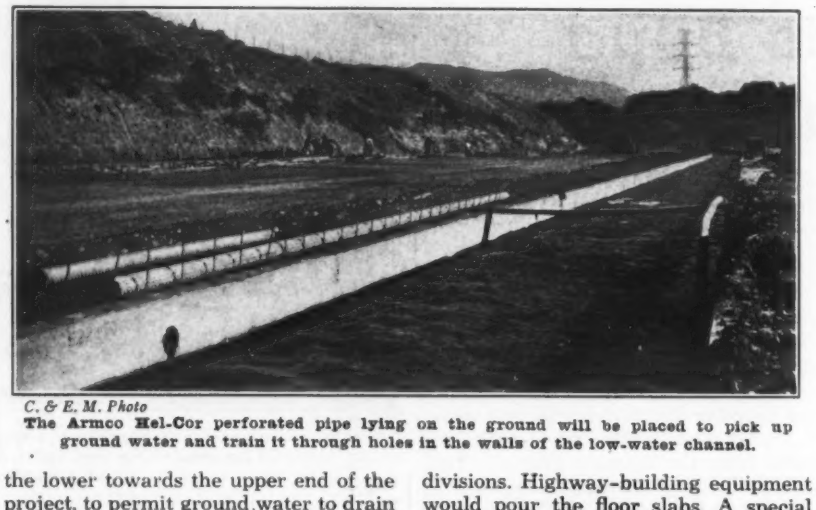
A signal from Warner's studio even silenced noisy construction machinery from time to time, so sound tracks could catch the clear, throaty equivalent of "If you see anything you want, just whistle!" from the lips of sultry Lauren Bacall or other Warner stars in the celluloid world of make-believe. While there existed a reimbursable agreement for this, it helped to make the job one of problems, of contrasts, and work.

Organizing the Project

The project was organized and actively pushed under the general direction of T. P. Polich, Vice President of United Concrete Pipe Corp., who correlated the business wishes of the other contracting partners in the venture. Day-to-day supervision was under the direction of Roy Chinnici, Project Manager and General Superintendent.

In organizing the job, a headquarters yard and carpenter shop was set up near the mid-point on the job, just across the channel from Warner Brothers, on the right bank. The cement and aggregate-batching plant was set up at the top of a ramp near-by, where the channel would be easily accessible with no dead haul. A repair shop with welding equipment, machine tools, and parts for the prompt repair of equipment was also located at the headquarters.

Excavation had to be figured so the new channel floor could be opened from the lower towards the upper end of the project, to permit ground water to drain away. A river-diversion channel had to be dug in this connection to divert the normal flow away from the low-water-channel excavation.



C. & E. M. Photo
The Armco Hel-Cor perforated pipe lying on the ground will be placed to pick up ground water and train it through holes in the walls of the low-water channel.

Concrete work was organized in three divisions. Highway-building equipment would pour the floor slabs. A special conveyor with hopper and elephant trunk would handle concrete from a paver for the heavy hard-to-reach wall footings. The walls would be poured by a transfer bucket and crane, and special steel forms, standardized to fit dozens of pours, would have to be built.

Crews, foremen, and operators had to be hired. Most important of all, perhaps, the astronomic amounts of steel, cement, and perforated pipe specified in the plans had to be ordered. The job posed such quantities as 6,406,000 pounds of steel reinforcing bars, 107,000 barrels of cement, about 64,275 cubic yards of concrete, and 443,000 cubic yards of excavation mostly in soft material. Enough select cushion material to make a pervious mat at least 12 inches thick under the entire invert slab had to be dug, hauled, and spread.

Excavation Is Tough

Excavation of the river channel started at the lower end of the job. A Lima Model 1201 dragline with an 85-foot boom and a 3½-cubic-yard bucket moved in to start the first cut, far over against the left bank of the new channel.

Dirt quantities were figured to bal-

(Continued on next page)

HODGMAN *Protection*

INSURES CONSTRUCTION

● **No. 3062 Waders — Sturdy, comfortable waders for construction workers and all who work in wet, muddy places. Made of strong jersey type fabric coated with a natural rubber compound. Seams, crotch and inseam fully reinforced. Sturdy black rubber boots with cleated sole and molded heel. Suspender straps equipped with buckles.**

★

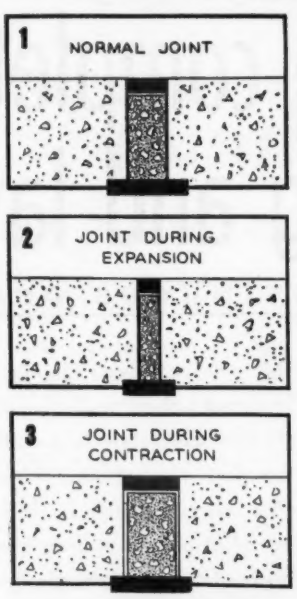
WRITE FOR COMPLETE CATALOG OF PROTECTIVE CLOTHING.

Hodgman Rubber Co.
FRAMINGHAM, MASS.

Para-Plastic and KORK-PAK

the ideal combination for maximum seal protection in expansion joints

HOT POURING PARA-PLASTIC OVER KORK-PAK FILLER



KORK-PAK fills the joint fully at the time of insertion, and rests at the bottom on the premolded strip of Para-Plastic called Baseal. It is covered at the top with hot poured Para-Plastic.

During compression, as in periods of maximum concrete expansion, Kork-Pak will not extrude. It takes the full compression exerted in the normal joint and then recovers more than 80%.

During contraction, the higher resiliency of Kork-Pak permits a more complete filling of the joint than ordinary fibre materials, thus preventing large openings between it and the concrete which could become filled with non-resilient materials and cause a blow-up.

Para-Plastic is a rubbery, resilient, adhesive plastic which will adhere to steel, metal, wood, tile, glass, concrete and all forms of masonry. It is cohesive, as well as adhesive, and is therefore self-healing.

Para-Plastic will not become brittle or hard at low temperatures. It remains resilient, adhesive and effective at temperatures from zero to 140° F., and in this range will maintain a positive bond, a continuous seal.

Para-Plastic is now available in several colors in addition to black, which makes it possible to extend the application of this remarkable material to an almost unlimited number of uses, where black was not suitable. Colored Para-Plastic meets Federal Specification SSF-336.

KORK-PAK gives you 5 definite advantages

1. **Kork-Pak** is more fully resilient. It has a greater recovery, between 80% and 90%, as against 70% for ordinary fibre joints. The more fully the space below the seal is kept filled during contraction, the less danger exists of penetration of the seal by dirt, stones and other non-compressible material, which might cause a blow-up when expansion takes place.

Contractors will find that less sealing material is needed when **Kork-Pak** is used because it keeps the joint more nearly filled.

2. **Kork-Pak** handles without breaking.

3. **Kork-Pak** absorbs less water—only 8% by volume as against 15% for ordinary fibres.

4. **Kork-Pak** is non-extruding.

5. **Kork-Pak** has the desirable characteristics of the more expensive joints combined with low cost.

A ZERO LASTIC PRODUCT

SERVICISED QUALITY PRODUCTS

Para-Plastic is manufactured under rigid Zero-Lastic License quality control

PARA-PLASTIC is available in black and colors

SERVICISED PRODUCTS CORP.

6051 West 65th Street, Chicago 38, Ill.

ance without having to waste excess yardage on long hauls, a lesson learned in the earlier days of channel construction. The dirt excavation was primarily a dragline casting operation, though a fleet of 20 six-wheel-drive International dump trucks was used to equalize the dirt along the stream channel.

When the 1201 Lima dug the first block of material from the third of the channel towards the left bank, it also excavated a diversion channel for the Los Angeles River. Roy Chinnici planned to train all normal stream flow plus the excess ground water he encountered over to this diversion ditch. Most of the dirt from the left-bank cut was cast off to the side, for later use as backfill against the concrete walls. Objectionable matter for backfill was hauled and wasted in special areas, designated by the Government, outside the critical limits of compacted backfill.

The big Lima dragline worked along on comparatively shallow digging, and handled a bank from 6 to 10 feet high. Near the lower end of the job a protruding rock ledge came up to plague the work, but Resident Engineer Morgan was able from his past experience with the same ledge eight years ago to offer some valuable advice as to methods of handling it. Six Ingersoll-Rand Jackhamers with three compressors were used, and the holes loaded and shot with 60 per cent gelatin.

A Model 95 Northwest dragline with a 3-cubic-yard bucket then moved in to handle the center cut, and still later a Model 80-D Northwest dragline dug on the third cut. The presence of ground water about 18 inches above grade line, and sometimes around the tracks of the machines, made the use of crawler pads necessary most of the time.

In a few places where the bank was high, however, it was possible to use tractor equipment. Four Caterpillar D-8's with LeTourneau Carryalls, aided by a D8 pusher, all saw service. There were several Allis-Chalmers HD-14's on the job, all war-surplus equipment, but they were used generally as bulldozers or pushers.

As soon as the initial cuts were opened up, work was centered around the low-water-channel excavation and the removal of dirt in the right half of the main channel. But the diversion-channel excavation was kept far enough ahead to train the water over to that side in advance of any fine-grading.

C. & E. M. Photo

Set up near the flood-control channel job, this batch plant weighs out dry concrete materials while a transport truck unloads bulk cement at the left. The conveyor belt, at the right, leads from a timbered tunnel underneath stockpiles of aggregates.

Excavation from start to finish was hampered by endless springs of clear, cold water. They bubbled up all around the machines. Where they were bad, but the foundation was sandy, French drains were dug towards the diversion channel and the water was trained that way. Where the foundation material was unsuitable or unstable, as was the case with all blue mud, whole pockets were removed and replaced with select pervious sand. However, the Government's estimate for over-excavation of this additional material had not been used up by 9,000 cubic yards when the job was nearly complete.

The three fast, high-capacity draglines were rated at a digging potential of 1,600 cubic yards in 8 hours, and were able to stay ahead of the remainder of the work in that time.

Ground Water Is Slowed

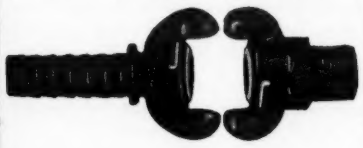
With the fresh channel excavation bleeding ground water everywhere, it was necessary to find a way to replace

(Continued on next page)

KELLY HOSE COUPLINGS

TROJON AIR HOSE COUPLINGS

MALLEABLE IRON—RUST PROOFED



UNIVERSAL TYPE—Locking heads of all styles and sizes interchangeable from ¼" to 1".

QUICK-ACTION—Instantly connected or disconnected with one-quarter turn.

TIME TESTED—DEPENDABLE. Manufacturer of these couplings since 1921.

Write for Catalogue No. 110

Distributors in most principal cities

KELLY CHICAGO MACHINERY COMPANY
HOSE COUPLING DIVISION
2524 W MADISON ST. CHICAGO 12

THIS ONE MAN WAGON DRILL

gives more footage in less time

EASILY MOVED FROM HOLE TO HOLE

Pneumatic-tired wheels make handling easy. Wheel brackets may be interchanged, reducing wheel gauge from 51" to 36" for drilling on narrow benches.

QUICKLY SET UP AT ANY ANGLE

Drill guide is mounted on a universal type saddle, making it extremely flexible and allowing drill to be set at any angle to the cross bar.

LONG DRILL FEED—POSITIVE LOCKING BRAKES

Too frequent drill changes are eliminated by the long drill feed. No anchor pins are necessary—a spin of the brake wheel locks brakes tightly allowing no movement of the carriage.

JOY ROCK DRILLS

WAGON DRILLS · AIR COMPRESSORS

SULLIVAN DIVISION

JOY MANUFACTURING CO.

GENERAL OFFICES: HENRY W. OLIVER BLDG., PITTSBURGH, PA.

W&D C-1306

C. & E. M. Photo
To pour wall footings in the Los Angeles River flood-control channel, the contractors used this special elevated conveyor set-up, attached to a MultiFoote 34-E paver.

Flood Experts Build New Stream Channel

(Continued from preceding page)

the watery foundation with something stable enough to hold the massive load of concrete slabs. Special pit-run gravel, well graded from 3 inches down, was hauled in about 8 miles by a fleet of dump trucks, end-dumped in not less than 6-inch lifts, and spread by a Caterpillar D8 bulldozer. It packed down under the action of rubber tires to excellent densities.

Sumps were then dug in the low places and pumps put in to handle the water. At one time there were no less than 20 Jaeger Sure-Prime pumps, from 2 to 6 inches in size, working 24 hours a day handling water. This was especially true when concrete work began down in the flooded low-water channel.

The concentration of springs throughout this area was so great that some years back the City of Los Angeles installed a river intake and a filtration plant, where this water can be purified and put in the city's distribution system. The filtration-plant intake is only about 0.75 mile below the present contract limits.

Concrete Sequence

Concrete placing, designed to operate the batch plant at full capacity, was planned in the following order: The low-water river channel would be placed first so the river flow and ground water could be diverted through it. When it was in, three concrete crews could then work simultaneously on wall footings and on walls as well as on the invert slabs.

The work was planned to a schedule which would advance completed work upstream from the eastern limit, downstream. While shortages of various kinds and excess ground water forced minor deviations from the plan from time to time, it was followed to good advantage.

Batch Plant Is Erected

Batch-plant equipment for proportioning the dry concrete materials was set up on a flat bench less than 100 feet from the channel, approximately at the mid-point in the project. The setup was planned for the use of trucked-in bulk cement, and four sizes of aggregate.

Victor brand portland cement, trucked from the wholesale terminal in Glendale, was stored by a screw feeder to a 450-barrel custom-built silo. A 100-ton aggregate-batching plant with four 25-ton compartments was set near enough to the bulk-cement silo that the batches could be weighed out in one operation.

A ramp under the batch plant permitted batch trucks to drive under, take their four-batch loads in four dumps, and drive away to the job.

Sand and three sizes of coarse aggregate were supplied under a subcontract with Consolidated Rock Products Corp., and hauled in by trucks and semi-trailers. The various sizes of material were truck-dumped over a long timbered tunnel, and the materials pushed up to the feeder gates in the tunnel roof by a bulldozer blade mounted on an Allis-Chalmers HD-14. A 30-inch conveyor belt, driven by a 25-hp electric motor, carried sand and aggregates from the stockpiles up to the bins.

Two principal mixes were being batched when the project was visited by this writer. They were as given in the following table:

Mix No. 532, Low and High-Water Walls

	1.33-Cubic-Yard Batch	1.0-Cubic-Yard Batch
Sand	1,696 lbs.	1,272 lbs.
Rock, ½-inch max.	339 lbs.	254 lbs.
Rock, ¾-inch max.	1,272 lbs.	954 lbs.
Rock, 1½-inch max.	933 lbs.	700 lbs.
Portland cement	797 lbs.	598 lbs.
Water	48.8 gals.	36.6 gals.

Mix No. 534, Wall Footings and Invert

	1.33-Cubic-Yard Batch	1.0-Cubic-Yard Batch
Sand	1,559 lbs.	1,169 lbs.
Rock, ½-inch max.	390 lbs.	240 lbs.
Rock, ¾-inch max.	1,257 lbs.	942 lbs.
Rock, 1½-inch max.	1,040 lbs.	780 lbs.
Portland cement	814 lbs.	610 lbs.
Water	47.6 gals.	37.7 gals.

On the biggest day of the project, up to the time it was visited, 940 cubic yards of concrete materials had been handled in an 8-hour day. If crowded, the plant can handle 150 cubic yards an hour, for the feeding device is automatic and Kron dial scales record the weights progressively.

Three Concrete Crews

Three separate concrete crews poured the channel in as many general divisions. One crew handled nothing but walls. One crew poured wall footings. One crew with highway equipment poured the big invert slabs.

Highway equipment on the invert-slab work consisted of a Koehring Twinbatch paver, a Jaeger concrete spreader widened to work a 10-inch floor slab 28 feet 6 inches wide, and a Jaeger-Lakewood finisher widened similarly. For the first pour next to the low-water channel, the wheels of the spreader and finishing machines rode along on 4 x 6 timbers on the wood

(Continued on next page)

Shovel hoppers of two yard* capacity can be quickly and easily installed.

Adaptable **FOR NEW USES at NEW LOCATIONS**

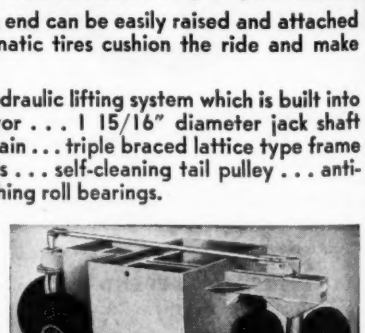
A heavy duty conveyor, the Cemco will readily handle rock, sand, gravel, coal, lime, and ore. Available in both portable and stationary units, a combination of sections may be added to the head and tail to make up a desired length. Your choice of 18", 24", 30" widths.

Perfectly balanced, the towing end can be easily raised and attached by one man. Standard pneumatic tires cushion the ride and make towing easy for a small truck.

Other features include: Hydraulic lifting system which is built into the "A" frame of the conveyor . . . 1 15/16" diameter jack shaft driven by an enclosed roller chain . . . triple braced lattice type frame . . . extra heavy troughing rolls . . . self-cleaning tail pulley . . . anti-friction pillow block and troughing roll bearings.

AIRPLANE-TIRED ROAD ROLLER

The Cemco Flat-Iron Roller's five pneumatic tires overlap to provide a compaction path of 72" to 75". Its low center of gravity permits work on shoulders and otherwise inaccessible places, even when loaded with 128 cu. ft. of sand. It smooths as it packs.



"Cemco" INC

SEE YOUR DEALER OR WRITE FOR LITERATURE

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ALSO MANUFACTURERS OF CEMCO HEAVY DUTY AGGREGATE BINS

GET YOUR AIR COSTS DOWN TO JAEGER FIGURES

75% to 100% larger "ultra lapped" valves,

20% to 30% slower piston speed,

100% efficient inter-cooling; force feed lubrication.

50% larger air receivers,

60 to 600 ft. sizes.

1. More air, and cooler, drier air per pound of fuel.
2. Full power behind your tools — no waiting — more work done.
3. Lowest upkeep cost of any compressor you have ever owned.

Efficient mass production in our new compressor plant makes possible precision-built machines of this quality at bedrock prices.

See your Jaeger distributor or write us for Catalog.

THE JAEGER MACHINE CO., Main Office and Factory, Columbus 16, Ohio

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forms. For the fill-in pour, of course, the wheels rested on the previous pour and the concrete wall footing. There were two 28½-foot lanes on each side of the low-water channel.

Seven batch trucks, each machine hauling four 1.33-cubic-yard batches, served this set-up, and the 10-inch slabs were laid down at a peak rate of 821 linear feet in 10 hours. That represented about 724 cubic yards of concrete.

The Koehring paver was spotted on the subgrade blanket outside the forms for the first pour, and traveled on finished concrete to build the second lane. With considerable dirt and dust on the finished concrete strip, it was not necessary to plank under the paver to prevent any damage to the slab.

Mixed concrete, dumped in the big dual-gate bucket of the Koehring machine, was deposited on the subgrade sometimes clear to the end of the 36-foot boom. It was thoroughly spread over the mat of steel by the Jaeger machine. Both edges of the slab were vibrated from the rear of the Jaeger spreader by two Viber internal vibrators. The passage of the Jaeger-Lakewood longitudinal finisher gave some additional consolidation and put the initial surface on the slab. From there on, cement finishers with long-handled wood floats, edging tools, and steel trowels completed the slab.

Heavy 1-inch asphaltic expansion joints were placed every 100 feet, and the entire structure is in effect a series of 100-foot channel monoliths set end to end.

Conveyor Pours Footings

A fast, economical adaptation of the conveyor-belt principle of material handling was used with good success on the wall footing pours. Some of the doweled wall reinforcing bars protruded to a height of about 9 feet above the footing slab. But the elevated conveyor raised the concrete without trouble up over the steel, and fed it to the farthermost limits of the pour through an elephant trunk.

The conveyor, 24 inches wide, was driven by a 4-cylinder Le Roi gasoline engine, connected by a drive shaft to driving gears at the top end of the 40-foot run. The entire contrivance was fastened to the boom of a MultiFoote 34-E paver, with the lower end underneath the paver bucket. In use, the paver bucket acted as a feeder hopper over the belt.

With from three to four batch trucks serving the set-up, depending on haul distance from the plant, this machine mixed and poured one of the 40-cubic-yard footings in an average time of 1.25 hours. Wall footings were especially tough to pour because they contained a maze of steel reinforcing bars. The concrete came out of the paver drum at a slump of about 2 inches. With the conveyor at its maximum angle of incline, there was no backward slippage of concrete at all as the mix traveled towards the top.

One man at the bottom of the flexible elephant trunk moved it around and fed the concrete over the pour. A Viber vibrator consolidated the mix around the heavy steel mat, and insured that the face would strip without pockets. Footing forms were built of 2-inch surfaced boards, held in place by 2 x 4-inch shoring on 5-foot centers.

Control of ground water was one of the big problems in connection with wall footings. The old diversion channel outside the footing limits was retained to good advantage, and four men in the form gang worked steadily to train the numerous springs and seep deposits over to this channel. Where the concentrations of water were especially heavy, men dug sumps, moved in a portable Jaeger pump, and dewatered.

Special Forms for Walls

Six sets of special steel forms were built to hold the tremendous weight of the 18-foot-high mass of concrete in wall pours; the concrete was mostly in a fluid state when pours proceeded with normal speed to the top of the forms. The face of each form was made of ⅜-inch steel plate, reinforced by 7 x 4-inch channel-iron studs on 22-inch centers. Alternate studs terminated about 48 inches short of the top of the form, since most of the stress was concentrated farther down.

The forms were built with two sets of 7 x 4-inch steel channel-iron wales, one set 3 feet from the bottom, the other 9½ feet from the bottom. Big steel tie bolts, 1⅞ inches in diameter, were provided on 44-inch centers. The panels were each 50 feet long, but built to disconnect at the mid-point.

Cleats inserted in the concrete wall footings at the back made it possible to line the forms perfectly along the back of the wall. Six big steamboat ratchets fastened from these cleats to the back form held it true to line, with the tie bolts holding the front form in place. By putting the ratchets behind the back

(*Concluded on next page*)

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Flood Experts Build New Stream Channel

(Continued from preceding page)

form, out of the way, there was no interference with concrete-pouring equipment which necessarily had to move around to fill one of the 50-foot forms in less than 2 hours.

The wall pours each catch some dowel steel from the footing, but no keyway was formed in the footing. The joint at this point was sandblasted with a Sullivan 105-cfm Zeph-Air portable compressor supplying power.

Wall concrete was mixed in 1⅓-cubic-yard batches as supplied by three batch trucks, dumped from the Multi-Foote 34-E mixing drum to a transfer bucket, and hoisted by a self-propelled rubber-mounted Link-Belt Speeder crane to the hopper on top of the pour. The secret of excellent walls consisted of thin lifts spaced evenly all the way across the forms, adequate but not excessive vibration, and frequent changes in the location of the hopper and elephant trunk at the top of the pour.

The big steel forms, weighing 14 tons each, were stripped 48 hours after each pour by a Manitowoc Speedcrane and walked ahead.

Cost-Benefit Ratio Is High

The ratio of benefits to cost of the Los Angeles River channel improvement is 2.41, which is quite high compared to average flood-control work around the country. Colonel P. A. Feringa, Corps of Engineers, USA, brought this fact out in the 1947 hearings before the subcommittee of the Committee on Appropriations, U. S. Senate.

Personnel

The Niagara-Lankershim flood-control contract was designed by the Los Angeles Office of the Corps of Engineers, and was administered and supervised under the general direction of Colonel A. T. W. Moore, District Engineer.

On-the-job officials included T. P. Polich of United Concrete Pipe Corp. in charge, with Roy Chinnici as Project Manager. J. G. Morgan was the Resident Engineer, with George Burrell as his principal assistant. Lee Elmer handled the inspection of all earth work, Herbert Gray handled all inspection of concrete, and K. W. Towle inspected steel reinforcement.

Protective-Coating Data

Information about Sika Seal protective coating is contained in literature being distributed by the Sika Chemical Corp., 35 Gregory Ave., Passaic, N. J. The coating is for use on concrete, mortar, wood, or metallic surfaces. It is claimed to have excellent adhesion to either wet or dry surfaces.

The Sika Seal broadside describes the features of this compound, and shows photographs of it being applied to various surfaces. Instructions for application are included, and a description of the tests to which the compound has been subjected. There is also a list of the various other Sika products, with a brief description of what each one is designed to do.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 64.

Steel Co. Elects Officers

The election of new officers has been announced by the Midland Structural Steel Co., 1300 So. 54th Ave., Cicero, Ill. They are: President, Charles F. Jarrard; Vice President, O. C. Robbins; and Secretary-Treasurer, William Nemec. O. A. Scudder, former President, and B. N. Braun, Secretary-Treasurer, have both retired.

A new board of directors was elected consisting of Charles F. Jarrard, Thomas N. McGowen, and George E. Wilson, Jr.

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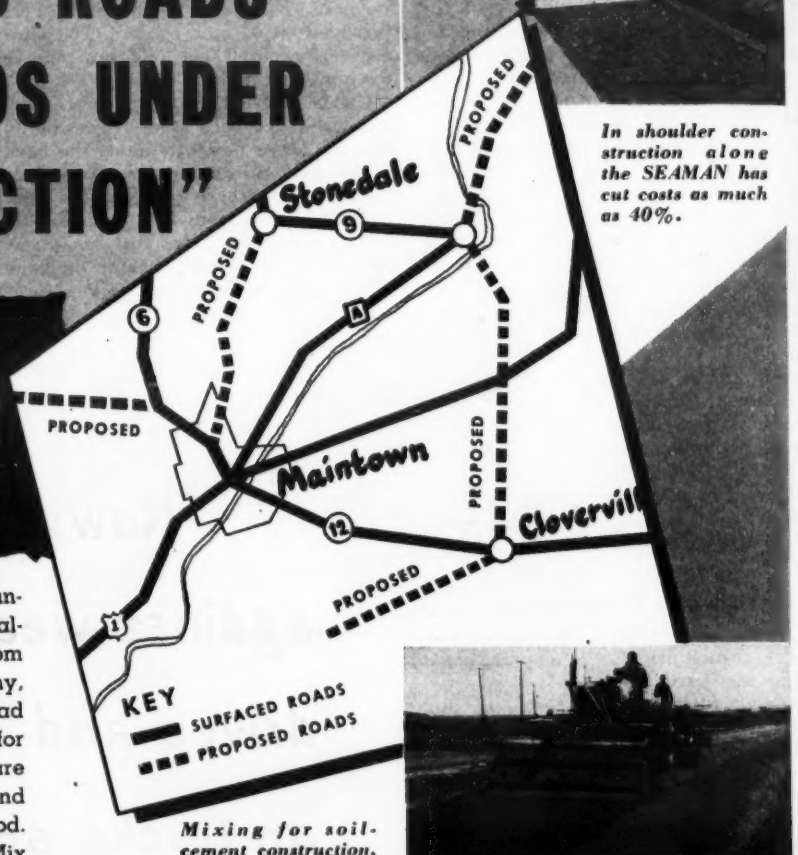

High construction costs have unquestionably prevented the vitally needed highway program from getting into full swing. But many, many more miles of high load bearing roads can be built for the same money if materials are mixed the SEAMAN-way — and if bids are based on that method. "Plant Mix Quality at Road Mix Cost" with the Seaman Mixer is a statement well founded in provable fact. . . . Highway authorities the country over are turning to the Seaman Mixer to give them more miles for their road-construction dollar, — and alert contractors are suggesting and bidding on SEAMAN-mixed construction. . . . Let the map read "Roads Under Construction" in your territory by specifying the SEAMAN MIXER.

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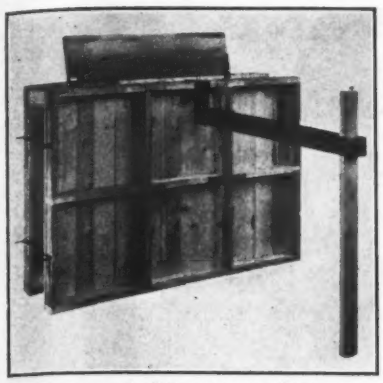

Here is a set of Symons panel forms, a splashboard and a scaffold beam for erecting a platform from which concrete can be poured into foundation forms.

Clamp Aids Erection Of Pouring Platform

A system of erecting scaffold beams for platforms from which concrete can be poured into foundation forms has been announced by the Symons Clamp & Mfg. Co., 4251 Diversey Ave., Chicago 39, Ill. Equipment and materials for erecting the platforms or runways consist of an oversize 4 x 4 beam, a 2 x 4 vertical support, a large steel hook which connects the beam to the panel forms, and a specially designed U-shaped clamp which connects the beam and the vertical support.

The steel hook is designed to fit over the top of a standard panel, and is secured to the end of the beam with heavy-gage-steel hardware bolts. The U-clamp is made to fit over a vertical 2 x 4 which butts against the horizontal beam. To secure the two beams, a steel wedge is placed through the slotted sides of the clamp. The manufacturer states that the clamp has been tested against an impact of 1,500 pounds. The equipment is designed so that the horizontal beam rests 6 inches below the top of the form. This is to allow a barrow or buggy to butt against the top of the form when pouring.

A splashboard is another Symons development for use in pouring foundations. It is 4 feet x 1 foot x 2 inches in size, and is equipped with steel prongs at each end which fit over the top of Symons standard panel forms.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 17.

Paper Tracing "Cloth"

A tracing paper said to have the advantages of tracing cloth has been developed by the Clearprint Paper Co., Dept. O, 15 First St., San Francisco, Calif. For years, tracing cloth has been used as a technical tracing medium because of its resistance to the ravages of time. Its disadvantages are sensitivity to atmospheric changes, resistance to pencil marking and ink erasure, and susceptibility to cracking when folded.

Officials of the Clearprint Paper Co. state that Papercloth shows stability under all atmospheric conditions, that it resists stretching, shrinking, and buckling. It is designed to take pencil and ink, to erase easily, and to resist damage by creases or folding. A sample of the paper will be sent free.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 39.

Galion Closes Pa. Office

The closing of its Harrisburg, Pa., branch office, and the retirement of R. E. Forsythe, Branch Manager, are announced simultaneously by The Galion Iron Works & Mfg. Co., Galion, Ohio. Mr. Forsythe will serve as Machinery Consultant to Galion and to the Allied Equipment Co. Allied is now sole distributor of Galion motor graders and rollers in the state of Pennsylvania. It maintains offices in Pittsburgh, Harrisburg, Scranton, Bryn Mawr, and Chambersburg.

Literature on Rock Bits

A catalog describing its line of rock bits has been put out by The Timken Roller Bearing Co., 1835 Dueber Ave. S. W., Canton, Ohio. This catalog, "Timken Rock Bits—The Economical Drilling Tool", explains and illustrates the features claimed for Timken rock bits. The pamphlet contains a series of photographs showing jobs of various types and in various locations, where Timken bits have been adopted as standard and are in constant use.

Three types of threads have been developed for use with the Timken rock bits, and these are discussed in detail. The booklet also contains a complete listing of styles and sizes in which the bits can be furnished.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 60.

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SCHRAMM INC.

THE COMPRESSOR PEOPLE. WEST CHESTER, PENNSYLVANIA

Old Slab Improved With Hot Topping

(*Continued from page 1*)

old concrete slab, widening to 22 feet, and covering the old road and the widening trench with 3 inches of hot-mix asphaltic concrete, applied in two 1½-inch layers. Some 10.746 miles of the contract was located between Chapman and Abilene; 2.84 miles stretched east from Solomon; and about a 2.4-mile section was west of the Saline County line.

Where this work was located, the state is mostly flat, with a few rolling hills. Soils are deep, and U. S. 40 at this point passes through the heart of the wheat belt. The highway carries about 100 very heavy transcontinental trucks per day, and the vehicle count is approximately 1,800 each 24-hour period.

Organizing the Job

When work began on August 15, 1946, the job was set up to start from the east end, finishing all construction work as the various phases were done. A location was secured adjacent to the Union Pacific Railroad tracks in the town of Detroit, Kans., so the new Barber-Greene hot-mix plant could be set up to operate. Patching started on the old slab to get that part of the work out as far ahead as possible.

Unusual, unseasonal, and unwanted rains succeeded in thwarting these plans. In fact, before the project was finally finished last July, rain played a generally delaying role. The job was pushed every workable day, however, and drained as much as possible even in the face of adverse weather predictions.

Patching Is Rushed

Originally it had been estimated by the Kansas State Highway Commission that the amount of concrete patching necessary would not be more than 3 per cent of the total square yards of surfacing. However, the progressive and serious disintegration of the slab had changed its original condition so much that about 6 per cent of the total surface was patched, before that work was finished.

The sections to be patched were marked off, ripped out with jackhammers and moil points, and the rejectable subgrade shoveled out. As much as possible, patches were made square and set with the diagonal congruent to the longitudinal joint in the old pavement.

Concrete patching, using high-early-strength cement, was put in 8 inches thick, floated smooth, and allowed to set for 72 hours before further work was attempted. Plenty of flagmen, traffic barricades, and caution signs were used to slow down traffic and carry it through the sections where patching was under way.

Equipment Widens Slab

Widening plans for the old slab called for a 2-foot extension on each side. The widening trench had to be dug at least 7½ inches deep to take the 1½-inch gravel-chat insulating blanket and two 3-inch courses of hot-mix filler.

A Caterpillar No. 12 motor grader was shop-equipped with a 24-inch blade, bolted to the moldboard of its standard blade. It then dug the trench just as it handled ordinary grading. The excess dirt was dumped out on the shoulder, and was used before the job was finished to build up the shoulders somewhat; it was not a disposal problem.

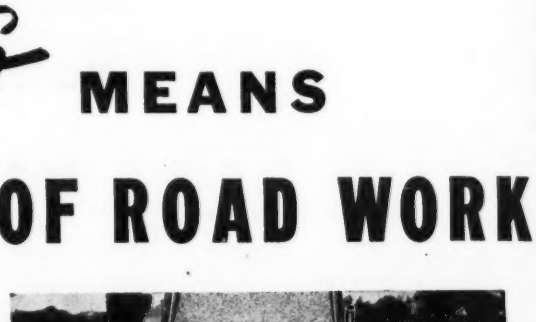
The gravel insulating course and the hot-mix binder course were placed in this rather inaccessible trench quickly and accurately, because Reno Construction Co. has built a special machine in its yard for this work. It consists of a 12-foot hopper fastened to the frame of a Hough front-end loader on an old Allis-Chalmers Model M gasoline tractor. A 12-inch auger, turning about 55 rpm, feeds hot-mix from the hopper towards the end of the box, where a 2-foot section is open at the bottom. The auger is driven by

(*Continued on next page*)

C. & E. M. Photos

The machine shown above in two views was shop-built by Reno Construction Co. to place hot-mix in widening trenches. It consists of a hopper fastened to the frame of a Hough front-end loader on an Allis-Chalmers Model M gasoline tractor. A 12-inch auger feeds hot-mix from the hopper to the end of the box where there is an opening in the bottom. The auger is driven by a shop-built drive shaft, chain-driven by the tractor power take-off.

SPRING MEANS PLENTY OF ROAD WORK



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The hopper rides along on four steel wheels, lowered to the pavement in normal use. The slot opening at the end is adjustable both for size and thickness. With the tractor moving along in first gear, placing can be done without ever stopping the rig. As much as 125 tons an hour has been placed by this machine, with a high degree of accuracy.

Two Galion Model F-1828 trench rollers were used to compact the 3-inch lifts as they went in. Another trench-roller wheel, attached to the moldboard of an Allis-Chalmers motor grader, also saw some service.

The heavy rains delayed widening possibly more than any other part of the work, chiefly because the open trenches were vulnerable to the water. The grade is so flat along this part of U. S. 40 that water simply filled the trenches to the top, and where clay subsoils were present it did not drain very readily.

After each rain, the trenches were drained by a labor crew with shovels. They dug small laterals to take the water away off the shoulders, and sometimes bailed out standing water. It was a slow, tedious, and costly business, but quite necessary if the job was to be finished.

The existing cracks and expansion joints were also filled with 2 inches of hot-mix. This work was very carefully done, and the cracks were not filled too full; usually they were left slightly above pavement level. Had they been overfilled beyond the slab level, a slight bump in the topping would almost invariably have resulted.

Hot-Mix Placed Rapidly

At least 2,000 feet ahead of the first topping course, the old slab was hit with a tack coat of 0.06 gallon of RC-1 asphalt per square yard, applied half width by an Etnyre pressure distributor. This distributor had a full-circulating bar, held 695 gallons, and was mounted on a snub-nosed Chevrolet truck.

The first lift of hot-mix was laid in two 10½-foot-wide strips by a fleet of seven dump trucks, hauling the hot-mix to a Barber-Greene Tamping-Leveling Finisher. Binder course was laid ahead of the topping by at least 24 hours. The Barber-Greene finisher spread the hot-mix accurately and evenly and filled all depressions, leaving a surface ribbon-smooth. According to the Job Superintendent, this machine put about 85 per cent of the ultimate compaction in the asphaltic concrete as it laid it down, making the correction for compaction quite negligible.

The operation of the finisher was kept as steady as possible. Its speed of laying was geared to the supply of trucks, so the rate of progress would be constant rather than sporadic. This resulted in a more uniform spread, with better timing on the roller. There was one big day when production zoomed to 990 tons in a single 9-hour-shift run, which was close to the rated maximum capacity of the plant. On that day, of course, everything worked at full speed. It was not unusual to run 110 tons an hour on binder course, and 102 tons per hour on topping, however.

Rolling varied with atmospheric conditions, but in all cases the joint made between the strips was always rolled out immediately behind the finisher. The overlap on new material was not more than about 6 inches. The rest of the big 9-ton Huber tandem roller stayed on the previously finished slab.

The amount of asphaltic cement varied between binder and topping courses. AC-4 material was used for both courses, at an application temperature of about 280 degrees F. This asphaltic cement had a penetration factor of 70-85. The two mixes were proportioned according to this formula:

	Per Cent	
	Binder	Topping
Rock aggregate	20	20
Sand	73	40
Mineral filler	7	10
Blow sand	...	30
Asphaltic cement	5½	6¼

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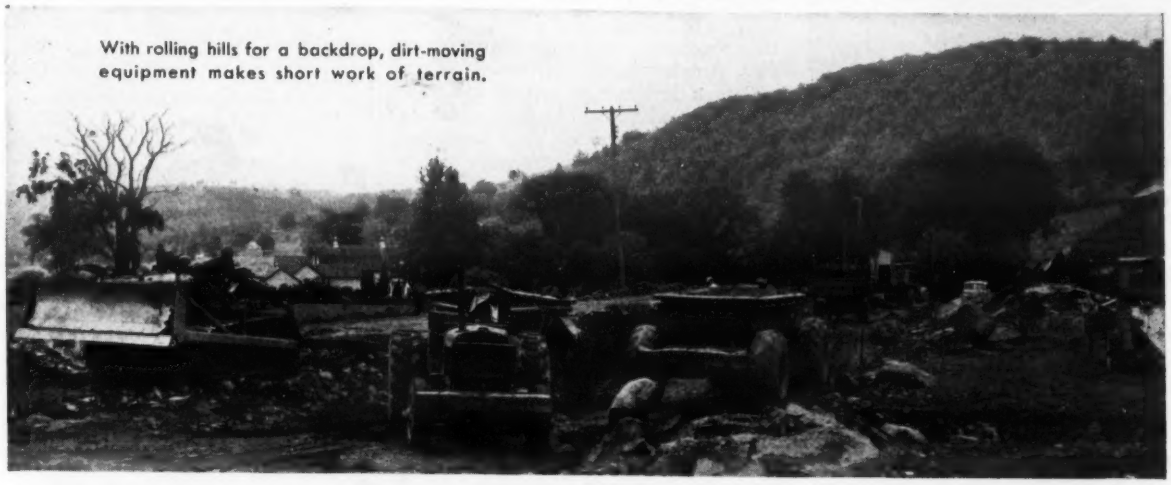
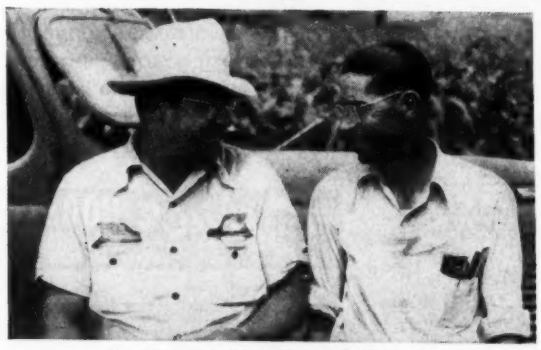


With rolling hills for a backdrop, dirt-moving equipment makes short work of terrain.

Building New Road in the Catskills

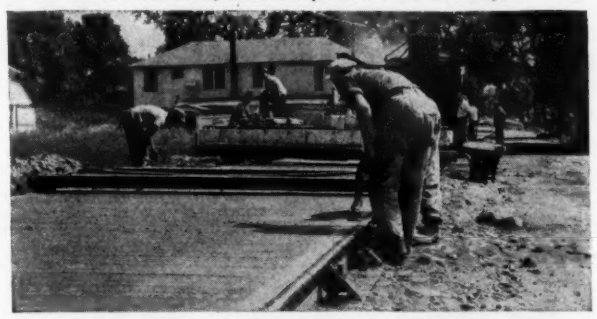


Joseph Serafini, contractor (left), chats with Andrew Moraes, superintendent.

Conveniently stored adjacent to highway, Bethlehem Bar Mat is raised into place after strikeoff.

Route 23, popular highway from southwestern Massachusetts to central New York, is now undergoing repair and relocation in the Catskill Mountains area. These photographs were taken between Prattsville and Windham, N. Y., and show construction by Serafini Construction Co., Binghamton, N. Y. Bridge reinforcing, bar mats and road joints were furnished by Bethlehem.

No time lost here. As workers spade concrete over bar mats, truck dumps new load into skip.



Broom-finished first lane starts to take shape. Here hand finisher completes work on side of slab.

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C. & E. M. Photo
Reno Construction Co. filled widening trenches on U. S. 40 in Kansas with 1½ inches of gravel-chat insulating blanket, prior to placing the hot-mix resurfacing.

Old Slab Improved With Hot Topping

(Continued from preceding page)

The mineral filler was a silty material, most of which would pass a No. 200 mesh screen. It was produced locally, and so was the blow sand, but the rock aggregate had to be shipped to the job by rail from Kansas City, Kans.

On the days when work was possible, such good progress was made that the officials in charge were in the enviable position of having produced at capacity for a high per cent of their working hours.

Modern Asphalt Plant

The asphalt plant serving this job was purchased new, and mixed its first batch on this project. It is a Barber-Greene plant, consisting of a Model 837 single-drum drier, a Model 851 dual cyclone dust collector, a Model 866 gradation-control unit, and a Model 848 normal-duty pugmill. The drier is driven by an International UD-18 diesel, the dust collector by an International UD-9 diesel, and the pugmill by a Buda gasoline engine.

Two steam boilers, an 8,000-gallon storage tank for RC-1, and two 8,000-gallon storage tanks for AC-4 asphalt were also in the picture. Boiler-feed water came from sumps excavated by the clamshell at the plant, and transferred by small deep-well pumps.

Asphalt had to be shipped by rail from Arkansas City, Kans. Because of the low storage capacity at the yard, about two cars of asphalt were kept on hand on the UP siding at the job. Detroit, where the Barber-Greene plant was set up, is almost halfway between the ends of the 10.746-mile job. The job hauls for this part of the work were short. In order to reach the west end of the third job, however, a 16-mile haul was necessary.

All storage tanks were insulated with asbestos, and covered with heavy tarred building paper wired down tight with baling wire. There was little heat loss even when temperatures were low. Another feature of the set-up was a 2-inch line which carried steam to heat the asphalt cars to their pumping point of 240 degrees. This same line could also be used to transfer fuel to the boilers.

A very heavy fuel oil was used in the burners of the two boilers; it was cut back with 2 pounds of Elmirite per 1,000 gallons of fuel. This treatment increases the flow characteristics of the fuel remarkably, resulting in better atomization and more efficient performance of the steam-generating system.

Cars of rock aggregate were unloaded by either a Northwest crane and clamshell or a Byers truck crane, and the feeder bins on the plant were also tended by these rigs. Rated at 125 tons output at 5 per cent moisture, the Barber-Greene plant operated consistently very close to that figure. The rated capacity was produced for four hours on the peak day. Since a square yard of asphaltic concrete 1 inch thick weighs only 125 pounds, it can readily be seen how much surface was covered when the weather let the plant produce.

Personnel

On-the-job officials for Reno Construction Co. included General Superintendent M. J. Paul and Job Superintendent M. C. Dunn, both of whom saw overseas service in World War II with Engineer troops. John B. McDaniel was the Resident Engineer for the Kansas State Highway Commission.

R. C. Keeling is the Kansas State Highway Engineer, with H. O. Reed as Construction Engineer.

Wilson Dealer in Oregon

Industrial Air Products Co., 3200 No. W. Yeon Ave., Portland 10, Oreg., has been appointed exclusive distributor for electrodes made by the Wilson Welder & Metals Co., Inc., New York, N. Y. Industrial will cover the entire state of Oregon.

Gravel-Plant Equipment

A 64-page catalog on the use of Link-Belt equipment in handling and preparing sand, gravel, and stone is available from the Link-Belt Co., 307 No. Michigan Ave., Chicago 1, Ill. Several types of elevators and conveyors — bucket, apron, belt, screw, and flight—are discussed in Book No. 2126. It also covers a full line of vibrating and revolving screens; various types of washing and dewatering units, including the Link-Belt Rotoscoop; mobile shovels, cranes, draglines; portable conveyors; loading spouts and gates; the Link-Belt Electrofluid drive, chain drives, speed reducers, variable-speed changers, etc.

The catalog is fully illustrated with photographs and diagrams. It includes tables of dimensions, weights, and other information of help in laying out or modernizing a mechanical handling or washing job.

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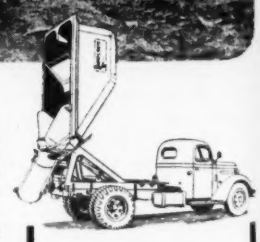

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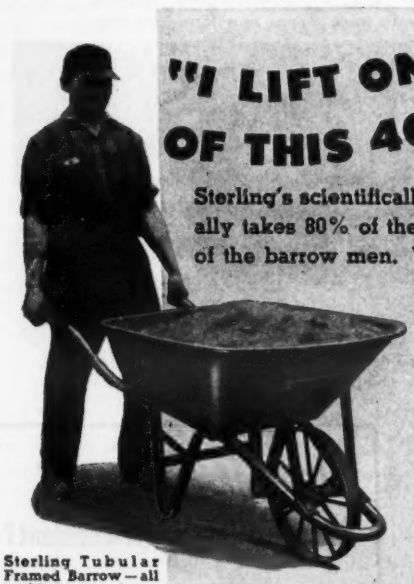

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Sterling WHEELBARROWS

The first 400,000-pound Porter roller is shown here at work on the Baltimore, Md., Friendship Airport. Its four Goodyear tires, 30.00-33 in size, stand 8 feet tall. Ballast for the load boxes consists of 80-pound iron ingots.

New Compaction Unit Has 200-Ton Weight

A 400,000-pound pneumatic-tire compactor has been designed by O. J. Porter & Co., 516 Ninth St., Sacramento, Calif. It is said to give maximum compaction of soil to a depth of 6 feet.

The steel body of the roller is 20 feet long, 7 feet wide, and 6 feet deep. The sides and bottom are built of ¾-inch steel plates, reinforced on the sides with 1-inch steel. Ballast for the load boxes consists of 80-pound iron ingots. Motive power is a 40,000-pound crawler tractor.

Goodyear tires are mounted on dual wheels, through the center of which is a steel axle, 12 inches in diameter and weighing 3,000 pounds. The mammoth tires are 30.00-33 in size, and stand 8 feet tall. They are nearly a yard in width, have a 60-ply rating, and are designed to carry inflation pressures up to 150 psi and give a pound pressure of 10 tons per square foot. The combined weight of tire and tube comes close to a ton.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 13.

Lincoln Names Clipsham

G. F. Clipsham has been named Assistant to the President of The Lincoln Electric Co., Cleveland, Ohio. From 1935 until his recent return to the United States, Mr. Clipsham was President of The Lincoln Electric Co., Welwyn Garden City, Herts, England.

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Remember, girls—having money of your own may not make you *more* attractive, but it certainly won't make you *less!*

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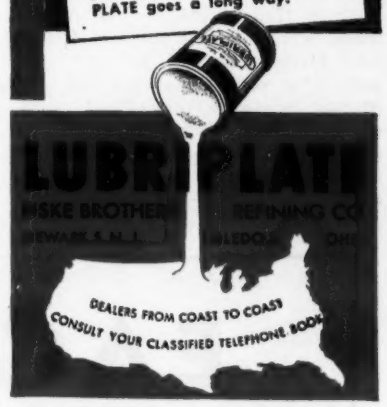

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Concrete Deterioration Subject of Investigation

Study of Bridges Reveals Reaction of Aggregate To Alkali in Cement Is Cause; Preventive Steps

By W. F. ABERCROMBIE, Engineer of Materials and Tests, State Highway Department of Georgia

✦ AN important and necessary phase of any research program for highways is the periodic checking on performance of structures and pavements in service. Highway engineers undertake such a checking from time to time through what are popularly known as "condition surveys", This report is based upon the information developed during one of these condition surveys.

During the summer of 1944, C. N. Crocker, Georgia Bridge Engineer, noted very peculiar cracking in the superstructure of a bridge at Lumber City. He requested L. E. Mallory of the Department to examine the structure which had been built in 1937 and 1938. The trouble was thought at that time to be due to severe internal stresses of unknown origin. About a year later the same type of cracking was noted by Mr. Mallory in a structure at Alapaha.

During November, 1946, Lyman Bradley, Bridge Engineer for the District Office of the Public Roads Administration in Atlanta, was making a periodic maintenance inspection of bridges in southeast Georgia. Mr. Bradley noted that rather wide-open and well defined cracks had developed in several pier caps of a 2,400-foot-high level steel-girder and concrete-deck bridge built in 1940 to 1943 across the Altamaha River on the Coastal Highway near Darien. One of the pier caps in particular, which supports one of the 85-foot approach spans, had a crack about ¾ inch wide just at the back anchor bolts and extending through the cap and down into the pier. This, with other associated cracks, severely endangered the spans. The condition was reported to the State Highway Department Bridge Engineer, Mr. Crocker. He immediately took steps to have repairs made which would put the bridge in a safe condition and would impede the future deterioration of the concrete.

This bridge had been let to contract in 1939 and the piers constructed soon thereafter. Then, due to the war, a delay of about 15 months had elapsed before work was begun on the superstructure. And the piers and caps had stood exposed to the elements all during that time.

Preliminary Study

Upon first examining the structure, the engineers felt considerable concern as to whether or not some excessive temperature contraction and expansion stresses were at work on it. But a careful examination revealed that the rollers on the ends of the girders were reasonably free and in a workable condition, and that the well defined cracks in pier-cap ends were in such a position that no external stress could possibly have been the cause.

Once they had exonerated external stresses, they launched a study of the materials, mixtures, and resulting strength of the concrete which made up the structure. Examination of the records showed that the aggregates and the cement were well within the specifications, and that the water had been tested and found to be satisfactory. The daily reports showed that satisfactory mixes had been used. And tests of the specimens of the concrete had showed some strengths 25 per cent higher at 28 days than the minimum required by the specifications. Therefore it appeared very evident that the failure was not due to faulty materials, inspection, or construction. The building of this bridge had one thing in common with the structures at Lumber City and Alapaha previously mentioned: that was the use of coarse aggregate and cement from the same sources.

In discussing possible causes for the failure of the concrete, the State and Federal engineers observed that the pattern cracking in these structures was similar to that reported between 1940 and 1943 by T. E. Stanton, Materials and Research Engineer, California Department of Highways.

Mr. Stanton stated that in one structure, well defined cracks were in evidence in the caps of the piers within three years after construction. Later these cracks extended into the columns, and a few months later all of the piers were more or less affected. Subsequent

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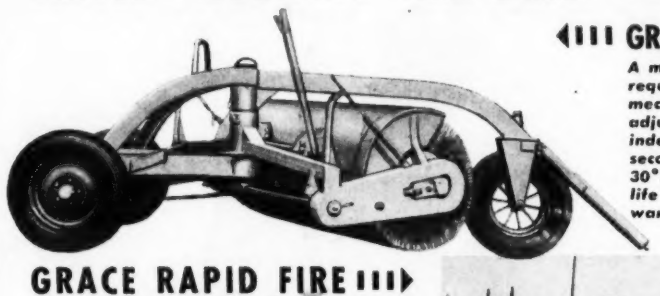

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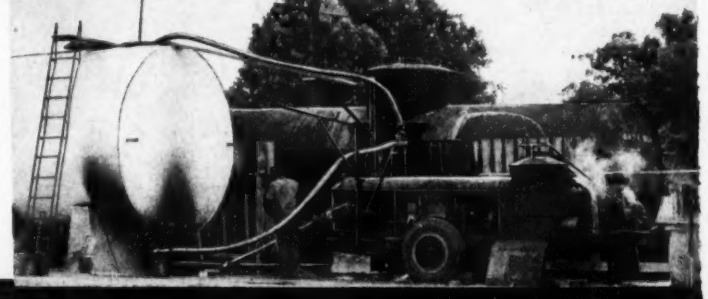

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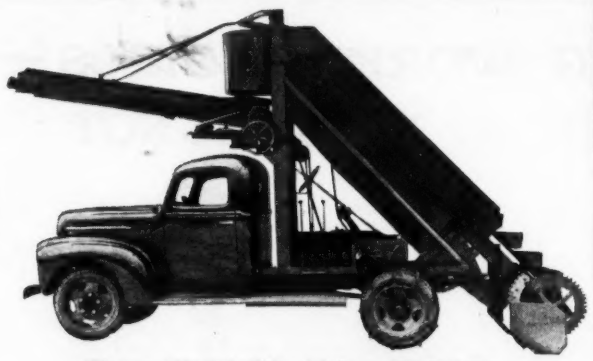

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to the trouble noted in this structure, several concrete trestles in which fine aggregate from the same river or its tributaries had been used also developed serious distress.

During this period, Mr. Stanton reported, similar structure failures were developing in Los Angeles and neighboring counties where the aggregates used were of the same general type. All of the failures noted followed the same general pattern and apparently were due to the same underlying cause.

The solution of the California problem was complicated by this fact: although cracking of the nature described was noted, without exception, only when local fine aggregates had been used, there were numerous instances where the same local aggregate had performed in an entirely normal and satisfactory manner.

Upon conclusive evidence that the local sand used in one of the projects had played an active part in the failure, a laboratory study was undertaken. Its purpose was to determine, if possible, the cause or causes of the trouble and the reason for the inconsistencies which had been noted not only in the locality under immediate investigation, but likewise in all the coast counties where similarly affected concrete had been observed.

The series of tests in the California laboratory study involved 1 x 1 x 10-inch mortar bars fabricated with the same sands and the same cements used in the structures. After a period of time in which expansion of the bars was constantly measured, failure or serious cracking occurred in the mortar specimens.

Other concrete structures in this west-coast area, in which the same type of local sand but a different cement were used, have never developed distress at any age. Observations of this fact gave rise to the suspicion (subsequently confirmed) that the expansion resulted from a chemical reaction between certain ingredients in the aggregate and some ingredient in the cement. Alkali in the cement in the form of the sodium and potassium oxides was suspected. And, as the cement used in one of the projects contained 1.14 per cent total alkalies, tests were made with another cement low in alkali (0.45 per cent). There was little if any expansion with the low-alkali cement in combination with the local sand which had shown so much expansion with the cement containing 1.14 per cent alkali.

The resultant expansion of the test bars has generally been roughly proportional to the alkali content of the cement, whenever used in combination with aggregates containing silica readily soluble in sodium hydroxide. On the other hand, sands containing negligible percentages of opaline shale and chert or highly soluble volcanic glasses have developed little, if any, expansion even with high-alkali cement. It was obvious, therefore, that when used with aggregates containing certain minerals, an otherwise sound but high-alkali cement is a contributing factor to excessive concrete expansion.

Further Investigation

Noting these findings reported by Mr. Stanton, the Georgia engineers speculated as to whether or not similar trouble existed in Georgia. There was some cause for doubt, since two or three laboratories outside the state had been investigating for several years the possibilities of there being reactive aggregates in the southeastern states, and no conclusive evidence in this direction had been found.

However, it was discovered that the cement used in the construction of these Georgia bridges was from a mill that ordinarily produced a high-alkali cement (i. e., one above 0.5 per cent calculated as sodium oxide) and that the coarse aggregates used were from one producer. So it was decided to look further into the possibility of alkali reaction by conducting a condition survey and a laboratory investigation to determine the cause of deterioration. Due to the large number of bridges and the time necessary to conduct a completely comprehensive survey, the investigations were limited to those bridge projects built since 1936 and those of over 200 feet in length.

Pertinent information was assembled in chart form from concrete-construction reports, field diaries, inspection reports, test reports, and correspondence files, for each project. The tabulations consisted of the project number, location, year constructed, contractor, cement, fine aggregate and coarse aggregate used, and remarks on anything found in the records that might possibly be of value in the survey.

During the tabulation of the pertinent data, a field inspection was made of the 100-odd structures listed. Each structure was thoroughly examined for cracking deterioration, crazing, excessive expansion, and the general overall condition of the concrete, and appropriate notes were made of the conditions found. Soon after the investigation started, it was evident that the structures fell into two general classifications of conditions of the concrete. These conditions were classified as Type I concrete and Type II.

Type I was classified as that concrete which acted normally as far as cracking, deterioration, etc., were concerned; which had a sound appearance and a good ring under a hammer; which was practically or entirely free of cracking beyond the usual temperature or deflection cracks; which had a normal color and which showed no stress worthy of note. Type II was classified as that concrete in which wide-open, incipient, and/or well defined cracks occurred and which definitely showed signs of some underlying cause of stress.

A study has been made of the notes taken on the structures examined to date. The engineers' condition surveys and laboratory studies are not yet complete. Complete data will be assembled later. But the data now available afford some interesting observations.

In making the studies, numerical designations were assigned to materials from different sources in order to hide

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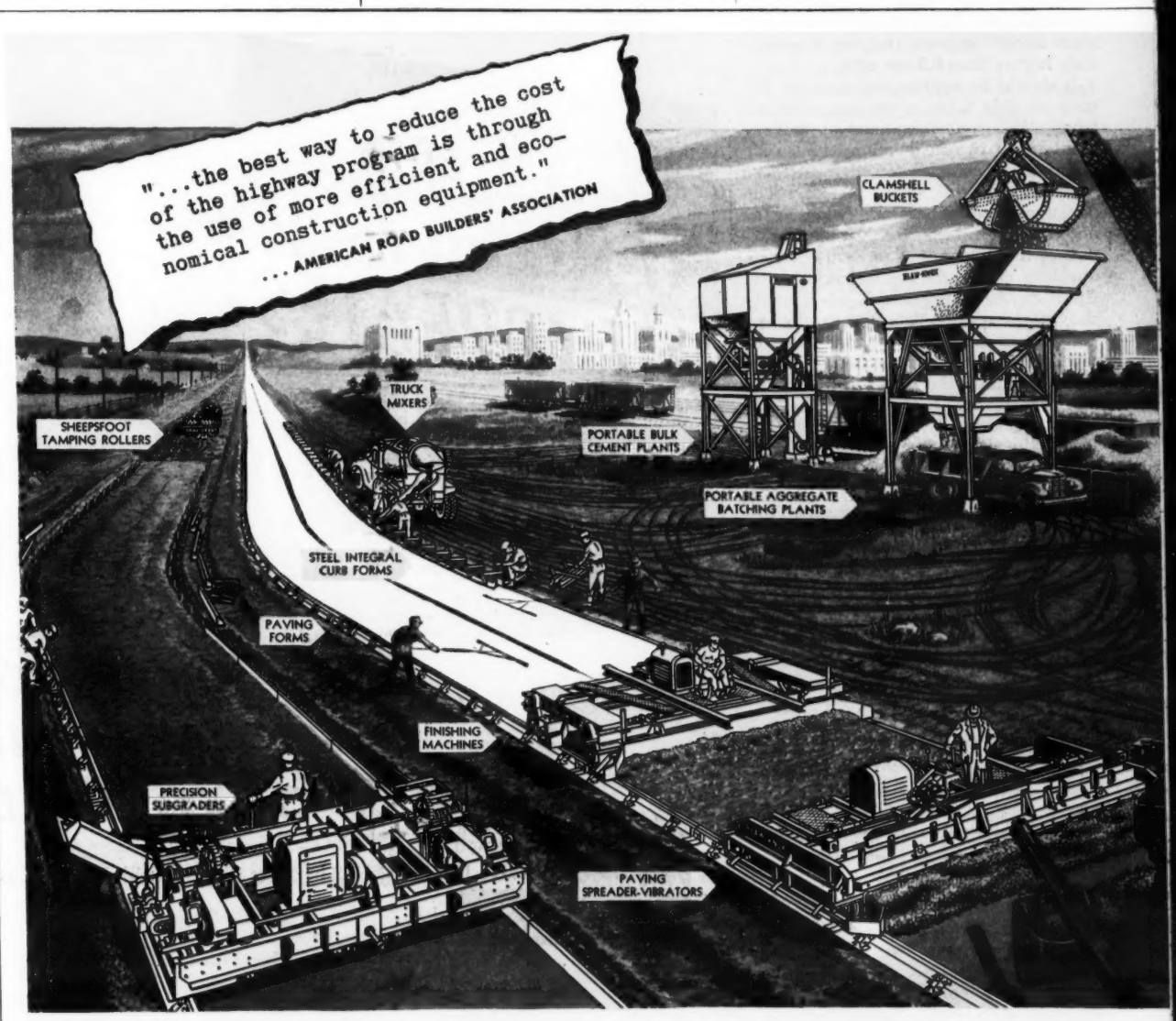
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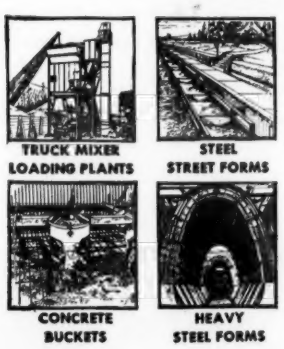

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Concrete Studies

(Continued from preceding page)

their identities and avoid any preconceived opinions during the examination of the data.

The average alkali content of cements as determined by periodical chemical analyses made between December, 1946, and October, 1947, is given in the following table:

Average Alkali Content of Cements Calculated As Na_2O

Cement Number	Per Cent Alkali
1	0.18
2	0.36
3	0.24
4	0.25
5	0.53
6	0.86
7	0.79
8	0.50
9	0.49

Note that two cements, Nos. 6 and 7, show alkali contents ranging considerably higher than 0.5 per cent.

It should be emphasized that the figures in this table were not obtained from alkali determinations of the cements used in construction; they were obtained on samples tested from these mills during the stated period. The question arises, therefore, whether or not these results are truly representative of the cements actually used. This question cannot be answered directly. But it can be stated that, from all available information to date, these mills had not altered materially their source of raw materials or their method of manufacture up until the time this investigation was made. Therefore we believe the results give at least a fair indication of how the alkali content ran during the period these bridges were under construction. If any difference in manufacture occurred, it favors the production of a lower-alkali cement in the past than in the more recent years preceding this investigation.

The following table shows the types of aggregates included, and a general mineralogical description. Please take special note of aggregate No. 2.

Types of Coarse Aggregate and General Mineralogical Description

Number	Type	Description
1	crushed stone	granite gneiss
2	gravel	mainly quartz and chert
3	gravel	mainly quartz
4	gravel	mainly quartz
5	gravel	mainly quartz
6	gravel	mainly quartz and chert
7	crushed stone	limestone
8	crushed stone	granite gneiss
9	crushed stone	granite gneiss
10	crushed stone	limestone
11	gravel	mainly quartz
12	gravel	mainly quartz

This next table is a summary of our investigation to date. The ordinates are the cement numbers, the abscissa are the coarse aggregates, and the figures shown in the columns are the fine-aggregate numbers. Those shown as plain figures are Type I concrete and those as asterisked figures are Type II. It will be noted that several of the fine aggregates occur in structures with both Type I concrete and Type II. Note that with a combination of cements Nos. 6 and 7, to which attention was called in Table I, and coarse aggregate No. 2, Type II concrete occurred in 100 per cent of the cases. Note further that in the cases where these cements were used in combination with other coarse aggregates, and where other cements were used with coarse aggregate No. 2, the concrete is Type I or free of deterioration.

Type of Concrete in Individual Structures Built With Different Aggregates and Cements

Coarse-Aggregate Number	Cement Number 1	2	3	4	5	6	7	8	9
1						15,1,5,11			
2	3,7	7	11	4	1	6*,7*,6*	12*		12
	6,7		1	4		6*,9*,7*	7*		7
	7,7		1	4		3*,3*,2*	7*		
	7,7		7	4		2*,2*,2*	12*		
	8,8		1	7		2*,2*,3*	9*		
	8,5					3*,7*,7*			
	5,5					7*,7*,7*			
	5,2					7*,2*,2*			
						2*,2*,5*			
						5*,5*,5*			
						7*,6*,7*			
						7*,2*,1*			
						15*,7*			
6			18						18
11			4						18
12			4						

Note: Plain—Type I concrete *—Type II concrete
Numbers in columns are fine aggregate numbers.

This information seemed to point to the combination of high-alkali cement and a coarse aggregate from one source as the cause of deterioration. And we began more investigations to see if this impression was correct.

Tests Made

All the literature we could find was searched to learn if a test was available to detect substances in aggregates reactive to alkali in cement. At the time, the only tests we could find were the small pat tests which were more on the order of a demonstration than a quantitative test. These tests consist of fabricating 4 x 4 x 1-inch specimens of mortar, subjecting them to an alkaline hydroxide solution under a sealed glass-top container, and observing at intervals for gel exudation.

Another test which had been investigated by Mr. Stanton consists of reducing coarse aggregate to sand size by crushing, and making a mortar with different cements. This mortar is then molded into 1 x 1 x 1-inch bars and measured at intervals for expansion both under normal conditions and after autoclaving.

To date both methods as employed in our laboratory have given disappointing results; and we have just about decided that either we did not include reactive particles, or the reactions are so slow that it will take a long period of time to develop the symptoms expected.

Still another method was tried. A pulverized sample of the aggregate was treated with a 0.001 N solution of NaOH. At the end of 24 hours the relative reaction was observed as determined by use of a color indicator. We found that the aggregate in question undoubtedly reacted with sodium hydroxide, but so did some other aggregates not involved in deterioration—though not to so great a degree.

Disappointed with results of the laboratory studies, we fell back on one method of detecting alkali reaction which consists of looking for so-called gel relics in the freshly spalled concrete. We became acquainted with this method during an inspection trip with D. O. Woolf of the Public Roads Administration Testing Laboratory, who noted these gel relics first in a deteriorating bridge at Thomasville, Ga., and later

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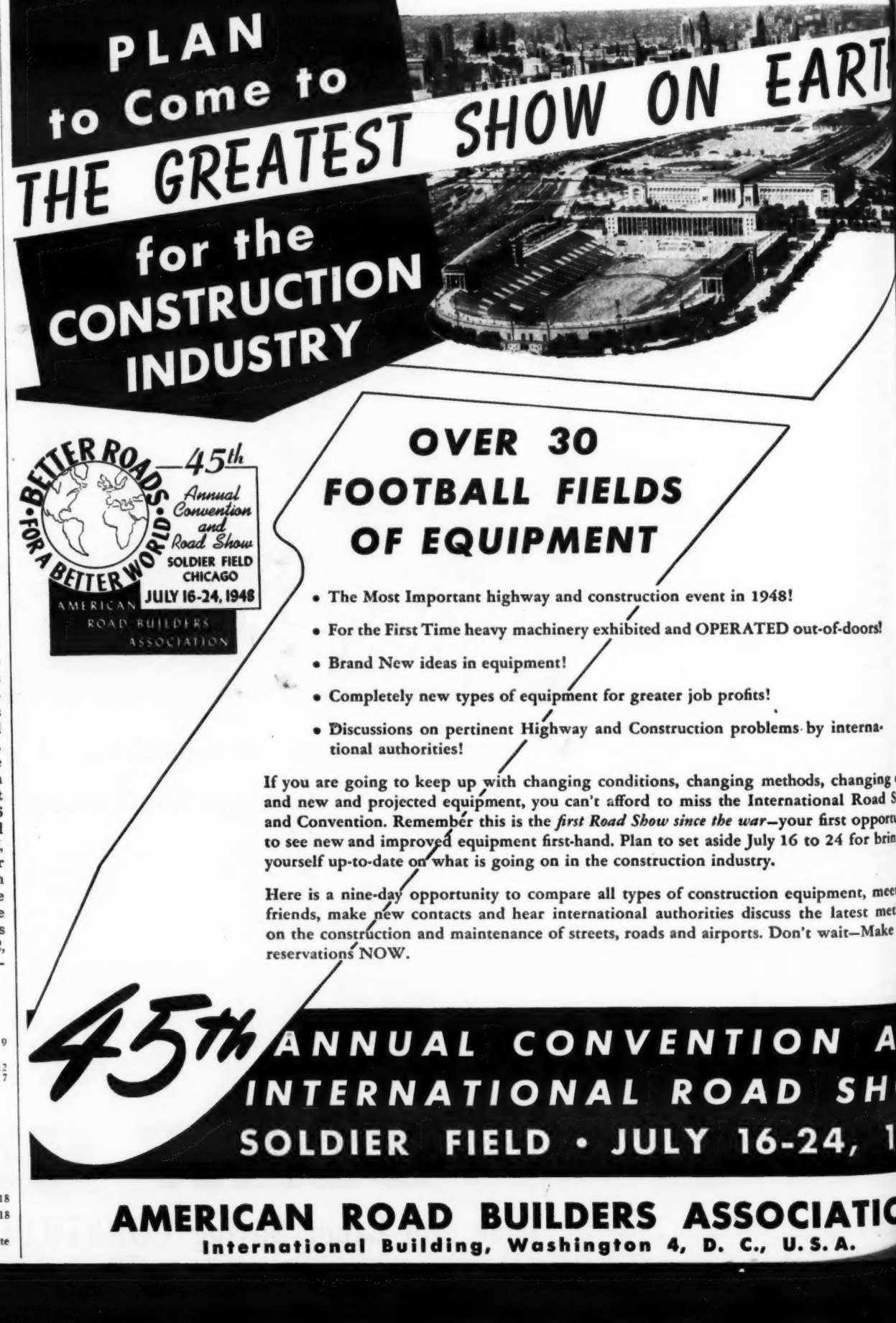
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This pier cap in the bridge over the Altamaha River in Georgia shows the type of cracks and concrete deterioration, a study of which is described in the accompanying article.

in several other bridges we inspected.

Some 55 structures were examined by breaking out fresh concrete. In all cases where the concrete made with the materials in question was broken, gel relics were found. These gel relics vary in size from microscopic to as large as a pea, and in rare cases to as large as a small bird egg. It is believed they are formed by deposition of the gel substance in air or water voids by migration through the concrete. When new they may be a jelly-like substance, but as they grow older the free moisture apparently disappears leaving the void filled with white powder. Generally associated with this is a glassy-like exudation on the inside surface of the voids. There are cases, however, where the void has not been completely filled. When examined under a fairly strong magnifying glass, these old partially filled gel relics have the appearance of the inside of an egg shell.

It was also noted that a white deposit existed just at the outer surface of certain gravel particles, where the particle had been broken through in spalling the concrete. Similar deposits have been noted completely covering the reinforcing steel and apparently partially destroying its bond with the concrete.

A few fragments of concrete from the pier cap on the South Altamaha River bridge, which was so badly deteriorated, had several gel relics. In one was found a large void completely filled with what might be described as a greyish gelatinous substance which soon dried to a white powder upon exposure to the air. It appears that the moisture existing in or entering the concrete dissolves the free alkali. As the solution comes in contact with the reactive silica of the aggregate, the reaction takes place with accompanying increase in volume. This sets up a pressure which causes the new solution to flow down through the matrix and collect in the voids, exude upon the surface, or form a ring around the reactive aggregate, and expand the concrete enough to crack it.

This idea, as to the flow of the solution, was formed by observing the face of a piece of spalled concrete; under fluorescent light, it showed the gel ring around a piece of reactive aggregate and the track it followed away from the aggregate to a void where it collected. Examination of a concrete slab showed gel discoloration down through the porous mortar although the customary gel relics were not very common. In another slab, short longitudinal cracks had formed; when the concrete along these cracks was broken, relatively large gel pockets in the proximity of a reactive aggregate and in the crack were discovered in a majority of the cracks.

General Conclusions

From this evidence found to date, we have concluded that we have just cause to blame the high-alkali cement-aggregate reaction for some of our failures of concrete. Some general observations made during the field investigations follow:

1. Deterioration occurs usually only when there is an opportunity for moisture to be absorbed in the concrete. It is the general rule that sheltered sections show no cracks or only incipient cracks and apparently are sound, judging from visual inspection.

There appears to be an exception to the association of water with disintegration, however, and this occurs where the concrete is constantly immersed. We have observed that there is an absence of cracks at or near the water line on bridge piers in streams. This may be due to: (a) the rapid leaching out or dilution of alkali or other chemicals by the large volume of water, or (b) the concrete at the water line being constantly saturated instead of alternately wet and dry. The more uniform condition of saturation would appear to have considerable bearing on the physical properties of the concrete, as well as an influence on chemical reactions within it.

2. As a general rule the lighter sections containing comparatively heavy reinforcement show only minor cracking, whereas the heavier sections carrying relatively lighter reinforcement are the more severely affected. For example, hand rails may be free of cracks and the posts severely cracked; bridge floor slabs will have very few cracks while curbs and sidewalks have many. This may be caused by the reinforcement absorbing enough of the tensile stresses or so distributing them as to form many microscopic cracks which are not detected by the naked eye, instead of allowing a few large ones to form. It was observed on an overpass at Quitman, Ga., that the heavily reinforced-concrete piling was not cracked, though concrete made with similar materials elsewhere in the structure was severely affected.

3. The use of high-alkali cement is usually accompanied in this area by a distinctive discoloration varying from reddish to yellow and brown. There has been some conjecture as to whether this discoloring originates within the concrete as a result of chemical reaction with iron or other metallic compounds in the aggregates, or from outside the concrete as a result of dust or clay particles being blown or thrown against concrete which is in a moist condition and has on its surface some chemical which reacts with the dust or clay particles. There is evidence enough to support both schools of thought either separately or in combination. It is generally agreed, however, that there seems to be a definite association of the discoloration with cements containing the higher percentages of alkali. This is true regardless of the aggregates used, though the discoloration seems to be more pronounced with the reactive aggregate heretofore mentioned.

4. Deterioration in this field becomes visibly apparent only after 6 to 7 or more years.

5. Color photography has been found

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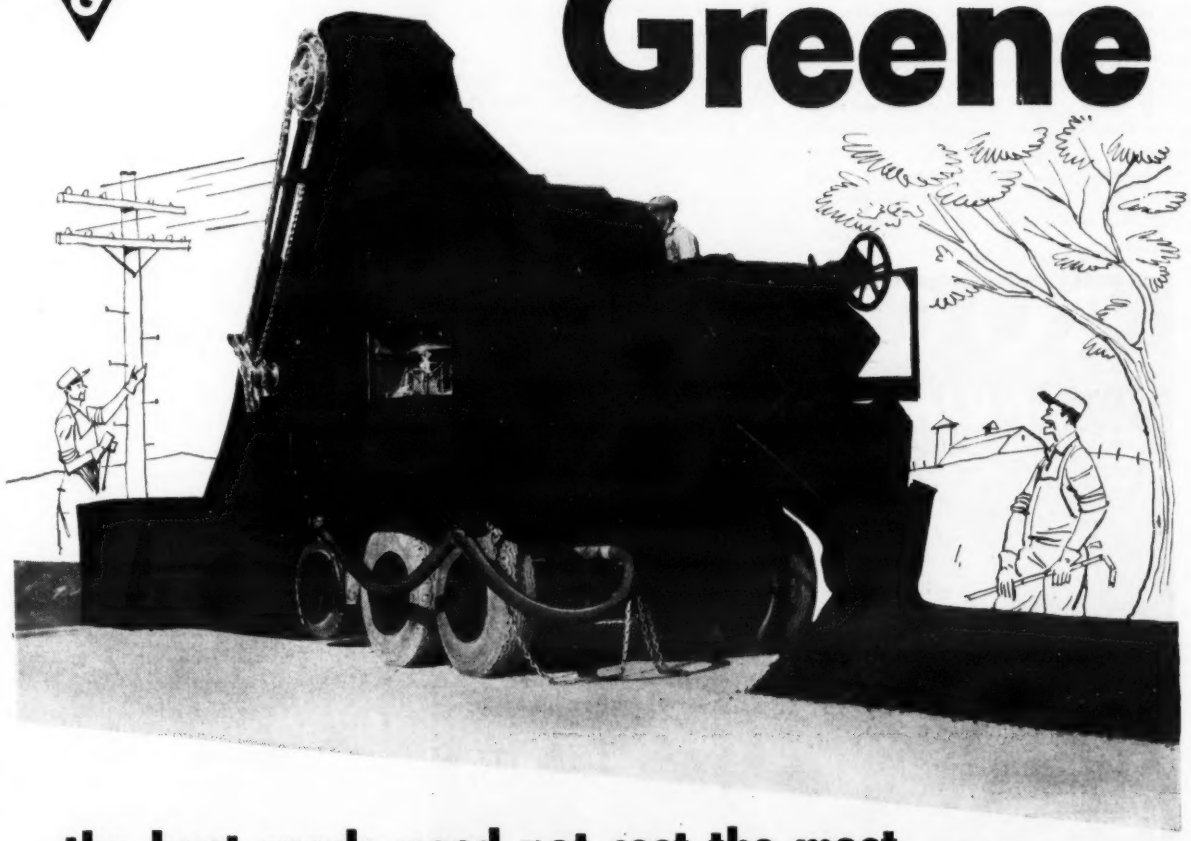

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Concrete Studies

(Continued from preceding page)

to be much more satisfactory than black and white in depicting the conditions.

6. Aside from the deterioration troubles we found in our condition survey, we picked up some ideas that should influence future design and maintenance practices. Due to the excessive expansion, many bridges were found to have cracked or shattered end walls, and skew spans rotated out of position due to expansion joints being jammed tight with dirt, pebbles, or other debris. It has been recommended that such joints be freed to relieve the end thrust which has been developed. Jacking back into position or major repairs are indicated in some cases.

The Cure

Believing we had pinned down the cause of deterioration, we found two important questions to be considered: (1) "What are we going to do to prevent this happening again?" and (2) "How shall we go about slowing down and repairing the damage being done on structures already in place?"

The first question we have temporarily answered by putting into effect a special provision which limits to 0.5 per cent the alkali in cement used with those aggregates containing cherty particles, or those aggregates which we have found to be reactive. This special provision has gone into the proposal for new projects, and has been effected by supplemental agreement for active projects already under contract where the combination was being used or was likely to be used. When we can develop a test that will detect harmfully reactive minerals in our aggregates, or when we have other information, we shall revise this Special Provision and our standard specifications accordingly.

The decision on the second question was to strengthen those structures dangerously weakened and to waterproof those showing minor or incipient cracking. This strengthening consists of cleaning the exposed surfaces of the affected structures by sand blasting, brushing, replacing spalled and unsound concrete, filling the larger cracks, and then painting with a waterproof paint. It is felt that by waterproofing the affected members of the structures and keeping the water out, the reaction can be greatly reduced or eventually stopped. For our observations indicate that the chemical reaction requires moisture and that only those members exposed to wetting and drying have shown distress.

Our action in setting the alkali content of cement at a maximum of 0.5 per cent has been questioned. But recently we have found concrete pavement slabs totaling some 25 miles which were built in 1929 with cement from a mill which now produces a cement containing 0.30 per cent to 0.48 per cent alkali and coarse aggregate from the same source mentioned heretofore. This concrete is severely deteriorated and filled with gel relics, and is now being replaced piecemeal. This would indicate that even lower alkali contents can contribute to reaction if given enough time, and a twenty-year review would be more revealing than our present ten-year review. In some of the older structures and pavements, deterioration may have been due, however, to causes which enforcement of the autoclave test is now precluding.

In summing up, it should be pointed out that we have good illustrations here of the value of reviewing old work. We are thus able to profit by what it teaches, as well as to determine if it is in need of special maintenance.

From a paper presented before the annual meeting of the Southeastern Association of State Highway Officials in Miami, Fla., in December, 1947.

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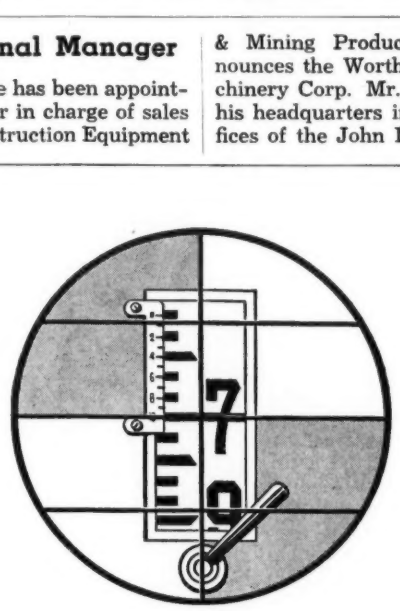

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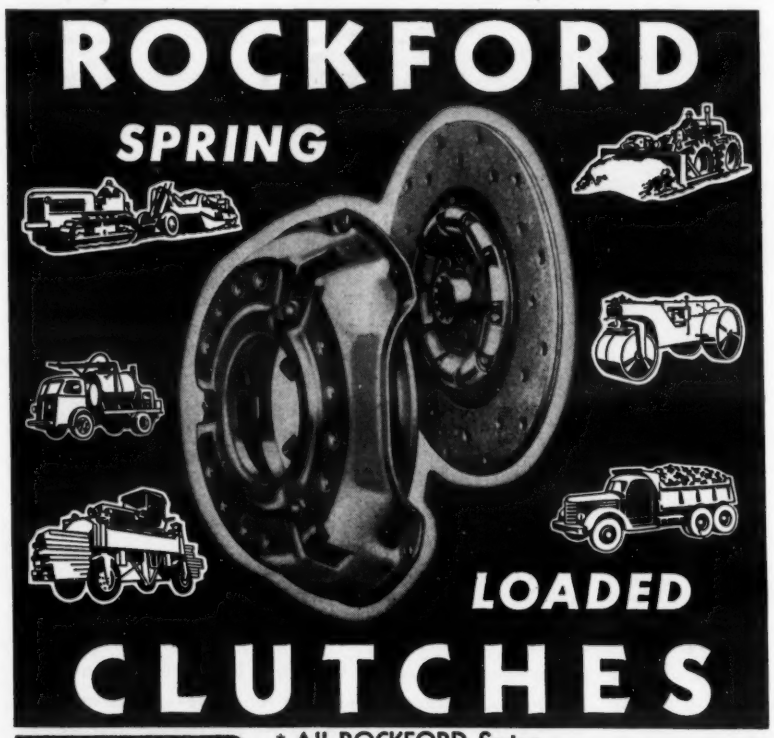

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Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Government Not Liable For Delay on Housing Job

THE PROBLEM: *On a Government housing project, a landscape contractor's work was to commence when another contractor had finished grading the site. It was contemplated that the grading would be finished by a specified date, but landscaping was to commence at actual date of grading completion if that were later than the contemplated date. The contractor requested that notice to him to proceed be withheld until the grading was finished. He was delayed about eleven months.*

Was he entitled to recover from the Government for increased costs of labor, materials, etc., entailed by the delay without the Government's fault?

THE ANSWER: No. (Stafford v. United States, 74 Fed. Supp. 155, decided by the United States Court of Claims.) Said the Court of Claims:

"The sum total of these facts clearly establishes a case of hardship on the part of the contractor, who entered into his contract in good faith, apparently calculating his bid price in reliance upon labor and material scales obtaining a year earlier. The increased expenses were not his fault. He was compelled to pay them in order to perform his contract. At the same time they do not show the Government to have been at fault." The Government's representatives "were not required to be more astute than the contractor himself in estimating when the site would actually be ready for plaintiff, nor in anticipating what changes might occur in the meantime. . . .

"Plaintiff himself had requested that the notice to proceed be withheld until the . . . [grading] contract was entirely completed. No modification of his request by plaintiff at a later date has been shown. There is nothing upon which to fashion a breach of the . . . contract provision, beyond the disappointment of the contractor in the mutual expectations of the parties that the starting date of plaintiff's work would not extend more than a few months beyond the contemplated date of completion of the" grading.

"It is meaningless to argue . . . that because there was no express provision in the contract exempting the Government from liability for damages from delay not contemplated by the contract, the Government should respond in damages to the plaintiff for his increased expenses, notwithstanding the absence of any showing that the Government had unnecessarily interfered to prevent plaintiff's work from proceeding within a reasonable time. To hold the Government liable under such circumstances would be tantamount to holding that the Government had unequivocally warranted that the site would be ready for plaintiff to proceed within that time which the parties might reasonably contemplate at the time they entered into the contract."

Contract Right to Check Books on a Cost-Plus Job

THE PROBLEM: *A subcontractor brought suit to recover for extra work on a cost-plus basis. Did the general contractor have a right to a court order to compel access to the subcontractor's books, under the contract clause quoted below?*

THE ANSWER: Yes, said the New York Supreme Court, Appellate Division, First Department. (Albert A. Volk Co. v. Caudwell-Wingate Co., 70 N. Y. Supp. 2d 662.)

The subcontract provided: "The subcontractor will render bills for any additional work at such time and in such forms as directed by the general contractor. For the purpose of checking such bills and any other claims, the subcontractor shall produce any and all data which the general contractor may request for the purpose of determining the correctness of the charges. Where any such additional work, ordered as provided herein, is to be paid for on a cost-plus basis, the subcontractor shall, for such purpose, permit the general contractor to audit his books. And he hereby authorizes the general contractor to check directly with his suppliers of labor and materials, the charges for such labor, materials, or other items appearing in the subcontractor's bills to the general contractor."

To the subcontractor's suit, the general contractor pleaded that the subcontractor had refused to submit certain data concerning the claim or to permit an audit or check with suppliers of labor, materials, etc.

The court decided that the contract right of the general contractor to an audit, etc., was not invalidated by repeal of a New York statute which had permitted bringing of an auxiliary suit to discover facts material to a principal suit.

The court said: "This power of audit involves verification of items of account. . . . Inquiry to ascertain the true situation with respect to financial matters beyond a mere superficial examination of books is essential to a proper audit. . . . The auditor may make such diligent search as may be necessary to confirm or establish the truth of the entries. . . . This contractual right would exist even if the present action had not been brought by the subcontractor. In the event of rendition of bills for extra work on a cost-plus basis, the enforcement of the right of audit might well be necessary in order to permit appellant as general contractor to ascertain whether it might in turn make a claim against the owner for such extras. Preliminary to this, however, appellant has the right to ascertain the honesty of the subcontractor's claim."

Disposal of Excavated Material—No Extra Pay

FIRST PROBLEM: *A subcontract for excavation for a dam does not seem to have provided specifically for disposal of excavated material, except that it should be used where practical in other parts of the work. The contractor required the subcontractor to construct a dike across the valley floor above the dam site, to protect the work against floods. The subcontractor complied without objection. Could he later recover extra compensation, on the ground that the direction by the contractor prevented the subcontractor from disposing of the material in the cheapest and most convenient way?*

THE ANSWER: No. (Sammons-Robertson Co. v. Massman Construction Co., 156 Fed. 2d 53, decided by the United States Circuit Court of Appeals, Tenth Circuit, and affirming a decision of the United States District

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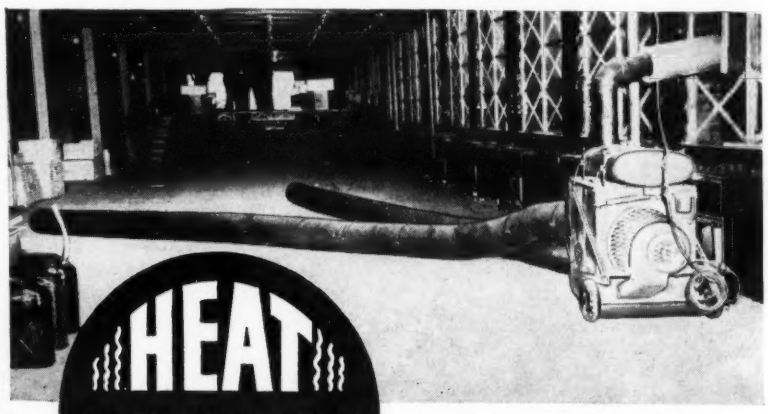

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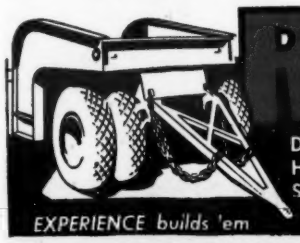

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Avoid Legal Pitfalls

(Continued from preceding page)

Court of Appeals, Tenth Circuit, and affirming a decision of the United States District Court, Northern District of Oklahoma.) The court said: "From the evidence it appears that the dike was considered necessary . . . to protect the work from flood waters. It was discussed between the parties in the negotiations for the subcontract. Sammons [the subcontractor] constructed the dike without objection."

SECOND PROBLEM: *Could the subcontractor recover extra compensation on the ground that, even if direction to construct the dike was proper, its construction at the particular location selected by the contractor entailed more expense in disposing of excavated material?*

THE ANSWER: No, for the same reason: that the subcontractor complied with the direction without objecting.

THIRD PROBLEM: *In the light of the contract provision that the excavated material should be used where practical in other parts of the work, with further provision that the subcontractor should receive extra compensation only for haulage exceeding 700 feet, was he entitled to extra pay for selecting, segregating, separating, and placing gravel which constituted part of the excavated material?*

THE ANSWER: No.

Dredging Contractor Makes Claim Against Government

THE PROBLEM: *A dredging contractor's trustee in bankruptcy made claims against the Government on the following grounds: (1) that damages were sustained by the contractor on encountering boulders and rock not covered by the contract; (2) that the Government forced the contractor to proceed with equipment not suited to remove boulders, etc.; (3) that proper equipment was not obtainable because of the Government's war-priorities system. Were the claims valid?*

THE ANSWER: Yes, said the United States Court of Claims. (Guion v. United States, 69 Fed. Supp. 841.) The court said:

"A serious question is raised . . . as to whether the contracting officer was justified in ordering the corporation back to work on the section which involved boulders, rock, and hardpan under threat of holding it responsible and suing its sureties. . . . The contracting officer and the officials of the Government had the same information about the priorities system as did the corporation, and while the plaintiff cannot recover for any hardship due to the priorities system, we are not inclined to hold, without going further into the facts, that in the light of . . . the impossibility of securing repairs and replacements and additional equipment for this type of work the corporation might not be entitled to recover the damages which it sustained by . . . being ordered to proceed with the work, notwithstanding the acknowledged unfitness of its equipment for . . . removing boulders, rock, and hardpan."

However, a clause of the contract required appeal from a contracting officer's decision to be taken within thirty days. And the court fully recognized that, under ordinary circumstances, failure to take such an appeal would preclude suit on a claim disallowed by the officer. It also recognized that failure to take such an appeal could not be excused on the ground that the appeal would have been futile, in the absence of a showing that the engineer in charge, who said that an appeal would be futile, acted in bad faith.

Court Holds Sub Entitled To Material He Excavated

THE PROBLEM: *A building contractor sublet excavation, but nothing was said about ownership of the excavated material in either the general contract or the subcontract. To whom did the material belong?*

THE ANSWER: To the subcontractor. (Welch v. McNeil, 214 Mass. 402, 101 N. E. 985.) The Massachusetts Supreme Judicial Court upheld his right to be paid the value of excavated sand used by the general contractor.

The defendant had contracted to construct a county building. The plaintiff was a subcontractor under the defendant. He was to do the excavating and grading, and was required "to cart away and dispose of all soil, rocks, etc., left over from the excavations and filling". This provision was also in the defendant's contract with the county. The land on which the building was to be erected belonged to the county. The sand in question was part of the material which, under his contract with the defendant, the plaintiff was obliged to excavate and cart away and dispose of. In making the excavation required, he had dug the material out and had piled it up on the premises preliminary to selling or otherwise disposing of it.

The court decided:

"Except for the provision in the contract that soil left over from excavations and filling shall be carted away and disposed of, the sand would have belonged to the county. But no claim to it is made or has been made by the county and the effect of the provision referred to is to operate, we think, as an abandonment of the sand by the county to the party making the excavations. The defendant did not excavate the sand in question and there is nothing in the contract between him and the plaintiff which gives him any claim to it. It is difficult to see what ground he has on which to base a right to it or to any part of it."

The court intimated that if there had been evidence before the court which tended to show a general custom in the community as to ownership of excavated materials, the custom would have been controlling—in the absence of specific provision in the contract.

Unsigned Papers Invalid

THE PROBLEM: *The contract for a WPA airbase project did not specify any date for completion. But unsigned copies of other papers drawn up before the contract was entered into did specify a date. The Government was bound to furnish the aggregate to be used on the job. Was it required to furnish the aggregate with sufficient promptness to enable the contractor to complete the work by the date specified in the unsigned copies?*

THE ANSWER: No. (Northwestern Engineering Co. v. United States, 154 Fed. 2d 793, decided by the United States Circuit Court of Appeals, Eighth Circuit, affirming a decision of the United States District Court for South Dakota.)

Since the copies naming a date for completion had not been signed by the parties, they could not be regarded as duplicate originals, said the Court of Appeals. "Under elementary principles, the instrument signed by the representatives of the parties . . . constituted the contract, and the rights and obligations of the parties must be determined from an examination of that instrument without regard to the unexplained notation appearing on the unsigned copies."

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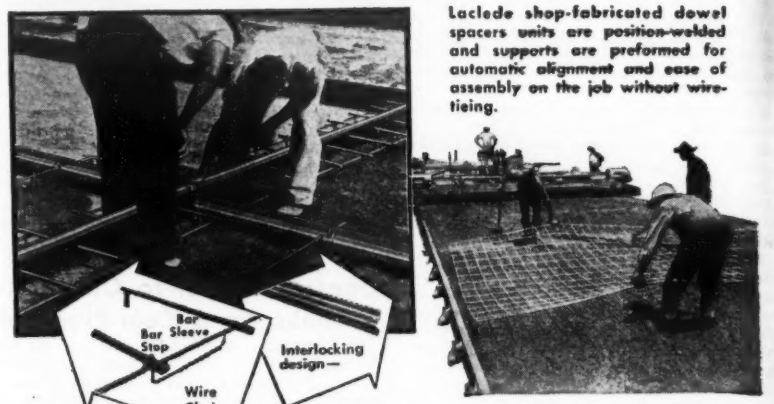

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THE CAP THAT DOES NOT FORGET TO CLOSE . . Completely automatic—the "RAINCAP" is counterbalanced to open when the tractor starts and close when it stops. Rust proof—made of cast aluminum—can be installed in two minutes. F.O.B. Waterloo, Iowa.

Immediate delivery
Liberal dealer discount

No.	O.D. Exhaust	Price
1	2⅛"	$1.90
2	2⅜"	1.90
3	2¾"	1.90
5	1⅞"	1.90
55	2"	1.90
6	1½"	1.90
66	1⅜"	1.90
7	2½"	1.90
8	3"	2.50
9	3⅛"	2.50
10	3¼"	2.50
11	3½"	2.75
12	4"	3.00

Write Dept. C-1

WATERLOO FOUNDRY CO., WATERLOO, IOWA

An operator uses a machine designed by Gibbons Co. to force Kraftcord paper packing into joints on airport runways prior to pouring joint filler. A compressing disk packs the cord down tight.

Paper Base for Use Under Joint Fillers

A paper-cord filler, to dam up the bottom of joints in airport runways and highways until rubber sealing compounds solidify, has been developed by E. W. Twitchell, Inc., 3rd and Somerset Sts., Philadelphia 33, Pa. This ⅜ to ½-inch packing is one of many Twitchell paper products. The company twists, presses, crushes, weaves paper and works it into many shapes.

Kraftcord was first used, it is reported, on runways at the Patuxent River Naval Air Station in Maryland. To place the material at the bottom of the joints, the contracting firm of James Gibbons Co., Relay, Md., developed a special hand-operated machine. Its central point is a reel on which the paper cord is wound. Feeding over a pulley arrangement, the cord is strung along the joint opening and forced downward by a compressing disk to pack it tightly into the opening.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 16.

Folder on Truck Loader

A folder describing its truck-mounted front-end loader can be obtained from the Butler Engineering & Mfg. Co., 4007 W. Washington Blvd., Chicago 24, Ill. These loaders are equipped with a clam-type shovel, and are designed for use in digging, loading, and scraping. The shovels are made in 12 and 14-cubic-foot sizes.

The folder features a sequence of photographs showing how the shovel approaches, picks up, and deposits a load in the truck body. A drawing shows how the clam-type shovel permits the lifting of full loads, and another drawing shows the loader in three positions of discharge. The final page of the folder features a diagram of the principal dimensions and clearances for both sizes of loaders, and a tabulation of important specifications.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 85.

Dual Shut-Off Valve Prevents Gas Waste

A quick shut-off valve designed to prevent oxygen and acetylene waste has been developed by the Linde Air Products Co., unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y. It is called the Oxweld V-31 dual shut-off station valve. When used with the oxyacetylene blowpipe, it is said to control the supply of both oxygen and acetylene or other fuel gas.

When welding operations are interrupted, the operator hangs the blowpipe on the hook of the Oxweld V-31—causing gas consumption to cease. The valve is designed to be completely sealed by a pressure as light as 12 ounces. When the operator wants to start again, he passes the blowpipe over the tip of the pilot light on the shut-off valve station. This causes the blowpipe to be lit again with the same flame adjustment.

The unit is designed for operating pressures up to 100 psi. The pilot-light volume can be adjusted or completely shut off by turning the pilot mixer. Each valve is supplied with an adjustable base for either wall or bench mounting.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 30.

Tour of Wire-Rope Plant Is Theme of New Catalog

A new picture booklet which shows step by step how wire rope is manufactured is available from the Macwhyte Co., Kenosha, Wis. "Life-Line", as the booklet is called, presents the story in pictures accompanied by short legends, in much the same manner as a strip film. Booklet No. 48-1 has 56 pages and is 4½ x 5 inches in size.

It opens with several pictures showing the uses for wire rope in industry, and the location and size of the Macwhyte plant. The story of actual design unfolds in pictures of the engineering department and metallurgical labs. From there, the reader is taken to the arrival, at the yard, of raw wire rods. Then actual production begins. The booklet shows how rods are drawn through dies to the desired diameter, how they are heat-treated, how the strands are built up and how the strands are combined into wire rope.

This bulletin describes the various combinations of wire and wire strands, the types of lay, and preformed and non-preformed wire rope. It also discusses other Macwhyte products, such as wire-rope slings, Safe-Lock terminals, etc.

Copies of this literature may be obtained from the company, or use the enclosed Request Card. Circle No. 74.

Hydraulic Sander

gives

√ CONTROLLED SPEED
√ CONTROLLED DENSITY
√ CONTROLLED DIRECTION

City, county and state highway departments use Hydro Spreaders because they provide the safe, sure way of sanding icy streets and roads. Easily installed on any dump truck with hydraulic hoist.

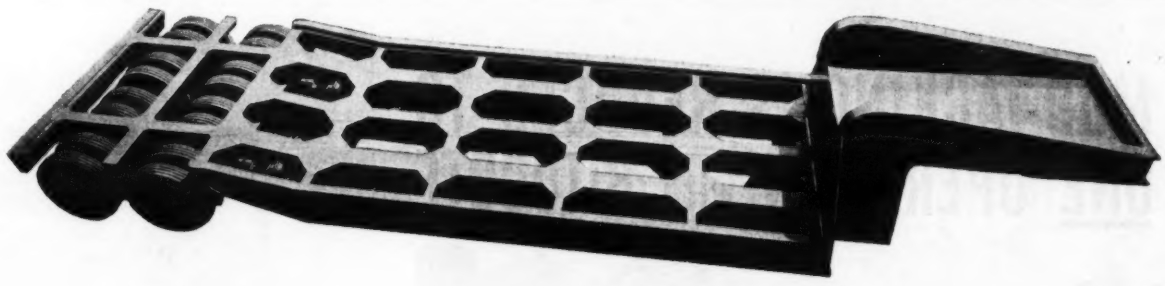
Material can be spread from 9 ft. to 35 ft. at speeds up to 30 m.p.h. All sprockets and chains are fully enclosed and material can be dumped over spreader without damage. One man can drive truck and operate spreader from cab.

An exclusive Hydro Spreader feature is the automatic gate opening device. When the driver starts the spreader the gates open and as the spreader is stopped the gates automatically close. There is no waste of material when spreader is not in operation. Hydraulic Spreaders are guaranteed to be free from defects in either materials or workmanship. Immediate delivery.

Write for illustrated folder. *Some Distributor Territories Available.*

Hydro Spreader Corp. 247 Madison Street Waukesha, Wisconsin

Phone: Waukesha 8040



Hughes Trailers Can Stand the Stress

Heavy loads and rough roads are tough on trailers. That's why Hughes trailers have a rugged gooseneck with wide, deep flange main beams running the full length of the trailer. The reinforced cross members and outriggers are channel sections. The entire frame is of electrically welded construction and oscillating axles take the twist out of rough hauling.

All Hughes trailers can be obtained in either drop or straight deck, semi or full, 15 to 100 ton capacity. See your nearest distributor or write for our catalog.

Dealers Attention: Distributorships available. All inquiries are given prompt attention.

L. J. Hughes Co., 1029 Brooke Boulevard Kenhorst, Reading, Penna.

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Branches: New York • Philadelphia • Chicago • Berkeley, Cal

Advertise your used equipment in the **"Trading Post"**

See page 107

Send your ad to:
Contractors & Engineers Monthly
470 Fourth Ave., New York 16, N.Y.

Concrete Powerhouse Is Built for High Dam

(*Continued from page 2*)

house. The Francis-type turbines, furnished by the S. Morgan Smith Co., have a nominal rating of 25,000 hp at 140-foot head. The Westinghouse generators are each rated at 20,000 kva, 18,000 kw, 9/10 power factor, 3 phase, 60 cycle, 13,800 volt for operation at 163.6 rpm normal speed. The total installed generator capacity will be 36,000 kw in the initial set-up of two units. The ultimate installation will have a capacity of 54,000 kw. With the initial two units in service, the plant will produce a total of about 120,000,000 kilowatt-hours of energy in an average year.

When the pool is at the top of the crest gates, elevation 663, the reservoir is 63 miles long with 620 miles of shore line and an area of 48 square miles. Its total storage capacity below this elevation is 1,706,000 acre-feet. Of this amount 353,000 acre-feet is for flood control between elevations 651 and 663. Power drawdown is allocated a capacity of 496,000 acre-feet from elevation 651 to 631. Below elevation 631 is dead storage of 857,000 acre-feet. The location is well suited for recreational usage, for it is in the northwestern foothills of the scenic Cumberland Mountains. It will be used for hunting, fishing, boating, and swimming.

Powerhouse

The powerhouse measures 97 x 206 feet and is nearly 100 feet high, measured from elevation 500.5 at the penstock gallery to 598.5, the highest point on the roof. It has six floors, the lowest at elevation 500.5, just below the penstocks. The others are at elevations 524.5, 536.0, 550.0, 567.0, and 584.0. The walls vary in thickness from 3 feet at the bottom to 1 foot at the top of the structure. The structural floor slabs also vary in thickness, according to the loading, from 4¼ to 22 inches; they generally have 2 inches of cement-mortar floor finish on top of that. The concrete beams average 3 feet in depth, spaced with regard to the imposed loads. Concrete columns are an average of 4 feet square.

Falsework to support the beam and slab forms consisted of 4 x 6 bents set in rows under the beams, placed from 24 to 48 inches apart, as required by the loading. These uprights were braced both directions horizontally with 1 x 6's at the bottoms and at approximately mid-height, but high enough to provide head room for easy access below the forms. Additional 2 x 6 horizontal bracing was provided at the top of each bent from one row to the next; this also provided bearing for 2 x 12 planks, which served as scaffolding for the setting of the beam bottoms. On top of the caps two 4 x 6's were laid as stringers under each beam. The proper grade was obtained with blocks and wedges inserted between the caps and stringers. On the stringers were laid the beam bottom forms. These consisted of ¾-inch tongue-and-groove lumber in 6-inch widths set on 2 x 6 joists at 12-inch centers.

At the beginning of the job all the forms were built right in place. But this method was later abandoned for a faster and more efficient system whereby sections of forms were assembled in the carpenter shop. (An unfortunate fire early last June completely destroyed the carpenter shop with all the power saws and other equipment.) These sections, resembling large wooden rectangular boxes, were then set in place by the derrick. Column forms were also made up in the shop and then fitted into position at the proper locations. The large floor sections made up the sides of the beams and the bottom of the slabs, and were set down on the 2 x 6 beam bottom joists.

The wall and column forms were also constructed of ¾-inch tongue-and-groove 6-inch stock. To prevent the boards from cupping, or developing an undesired camber, two thin grooves were cut into one side of the boards. These equally spaced grooves were cut by power saws to a depth of only ⅜ inch lengthwise along the underside of the boards. The grooves appeared to keep the wood in line without weakening the formwork. The ¾-inch sheeting was backed with 2 x 6 vertical studding on an average of 12-inch spacing, with double 2 x 6 wales on 30-inch centers for the heavier work. The bracing was made lighter according to the sections being poured. Form ties of ½-inch rods were spaced an average of 30 inches vertically and 36 inches horizontally.

Supply of Materials

Reinforcing steel was furnished by the Ceco Steel Products Corp. plant at Birmingham, Ala., while the structural steel required in the powerhouse came from two sources: the Sherwood Moore Iron Works, Inc., of Birmingham and the Decatur Iron & Steel Co. of Decatur, Ala. Bag cement was supplied by the Lehigh Portland Cement Co. of Mitchell, Ind. Although the dam is only 3 miles east of Celina, the nearest railroad is at Algood on the Tennessee Central Railway. It was there that most of the material and equipment was shipped. From Algood, trucks hauled the supplies 35 miles to the job site.

Rock for the fine and coarse aggregate was obtained from a quarry 7 miles away, where it was drilled, shot, and loaded into trucks for delivery to a crusher close to the dam. The crush-

(*Concluded on next page*)

MUD-JACKING IS REDUCED TO ONE OPERATION with BITUCOTE

Mud-jacking has become—not only a single, simple job—but also it's the *last* time that slab needs to be leveled when it's properly done with non-volatile, safe Bitucote asphalt emulsion... It's used unheated and it's non-hazardous.

Added to the slurry, pressure-pumped under the slab, it *cures* and *dries* there as a permanent, stable, water-resistant sub-base that *forms its own seal* right to the top surface of the slab. This *seal*—plus stability and resistance to impact and compression—*stops pumping*.

Mud-jacking takes on greater practicability, safety and importance with Bitucote - stabilized slurry—and it's economical and time-saving, too.

Bitucote PRODUCTS CO.

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Get more of the advantages of asphalt with Bitucote Emulsions!

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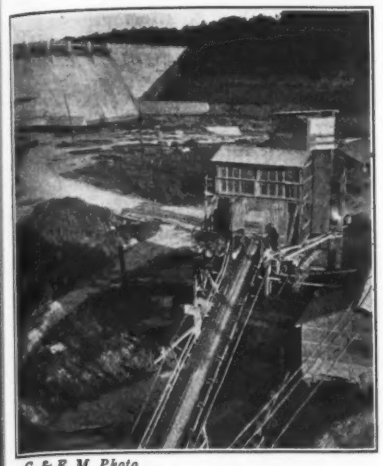
The JACKSON VIBRATORY PAVING TUBE

DON'T BE LATE FOR '48! GET THESE ADVANTAGES!

Important savings in cement can be made. Finishing progress is much more rapid. Concrete at forms and joints is puddled perfectly. Spreading costs reduced. Complete compaction and excellent finish obtained with less labor.

The JACKSON Paving Tube is perfectly adaptable to slabs 6" to 24" thick, without affecting the efficiency on single or two-course standard plain or reinforced concrete pavement construction and may be quickly adjusted from 10' to 25' widths in the field. Power Plant mounted on the Finisher has ample reserve power through entire frequency range of 3000 to 5000 VPM. Finger tip controls. Quickly and easily attached to any standard finisher — and can be attached to the rear of standard spreaders to advantage for vibrating the first course in thick slab construction. One of the best investments in equipment a paving contractor can make. See your Jackson distributor or write for further information NOW.

Manufactured by ELECTRIC TAMPER & EQUIPMENT CO. for
JACKSON VIBRATORS, INC. LUDINGTON, MICH.



C. & E. M. Photo
Morrison-Knudsen set up its Johnson batch plant near the south end of Dale Hollow Dam. The 36-inch conveyor belt shown here transports aggregate from the crushing plant. The bag-cement house appears at the right.

ing plant crushed and washed the stone, and manufactured the sand. By a system of screens and conveyors, it distributed the aggregate into four stockpiles, one for the sand and three for the different sizes of coarse aggregate —¾, 1½, and 3-inch.

Power for the various construction operations came partly from a 10,000-volt line of the Rural Electrification Administration which was stepped down by transformers to the voltages required. This source was supplemented by two diesel-electric generating sets—a Buckeye 500-hp diesel engine at 360 rpm which powered a General Electric 250-kw generator, and an Atlas Imperial 400-hp diesel running a 125-kw Electric Machinery generator. These units were installed in the contractor's powerhouse alongside of which was the compressor house.

The latter contained an Ingersoll-Rand 500-cfm and a Jaeger 315-cfm air compressor, both of which pumped air into a common receiver. From this, air was drawn off at 120-pound pressure to run the various pneumatic tools used on the job such as reamers, drills, saws, etc.

Concreting

The aggregate stockpiles were laid out over the top of a tunnel 175 feet long x 8 feet wide x 14 feet high constructed of 12 x 12 timbers. Through this tunnel ran a 36-inch conveyor belt which carried the aggregate out and up to the tower of the adjacent concrete batch plant. The amount and kind of aggregate desired was controlled from the batch plant. In the tunnel the material selected was first admitted from the stockpile into a hopper where it was weighed on Kron dial scales and then emptied onto the conveyor belt. Each stockpile had its own weigh hopper and scale.

At the Johnson batch plant the material was delivered into a bin. Adjacent to the plant was the cement house where the bag cement was stored. The bags were dumped into a hopper which fed the cement to an enclosed elevator. This in turn raised the material to a bin just above the Smith 2-yard concrete tilt-type mixer. A water storage tank was also at this level. A flow of pure water was always coming through a 12-inch pipe in the dam, and from this a 2-inch pipe was tapped to conduct water to the tank by means of gravity feed.

The cement, sand, stone, and water were weighed out for 2-yard batches on Kron dial scales, and then emptied into the mixer located on the level below. After the concrete was mixed it was dumped into a hopper underneath so that the 2-yard mixer could start mixing another batch. Trucks then pulled under the concrete plant and picked up a batch in the 2-yard bottom-dump buckets which they carried. Two to three trucks were usually sufficient for batch hauls since the distance from the concrete plant to the powerhouse was only 1,000 feet.

At the powerhouse the buckets were lifted from the trucks and swung over the forms by an Insley guy derrick with a 125-foot boom and a 140-foot mast. During the lower pours on the structure the derrick worked from inside the powerhouse. But as the work progressed upwards, the derrick was shifted to a point higher up on the face of the dam from where it could swing to reach the entire area where work was going on.

The derrick was operated with a Thomas 3-drum hoist—one drum to swing it full circle on the big bull wheel, another to raise and lower the boom, and the third to run the hook and cable. Besides handling reinforcing steel, the concrete forms and buckets, the derrick placed the steel roof trusses and all equipment and machinery within the powerhouse except for the turbine and generator equipment; this was handled by a permanently installed P & H 100-ton overhead traveling crane.

When a thin wall or a slender column was being poured, the big 2-yard buckets were emptied into sloping V-shaped hoppers placed on top of the forms. Also, when the high pours were being made the buckets could not be emptied directly into the forms. Then the concrete was dumped into hoppers to which elephant-trunk extension pipe was connected leading down into the forms. As the 1 : 2.2 : 4.2 mix was placed, the concrete was vibrated with Mall electric vibrators. Curing was done with water and burlap for a 14-day period.

Quantities and Personnel

The major items on the powerhouse contract included the following:

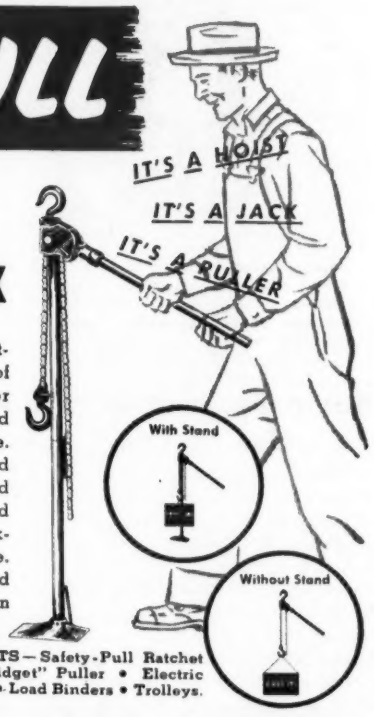
Concrete	10,500 cu. yds.
Reinforcing steel	1,000,000 lbs.
Structural steel	500,000 lbs.

A peak force of 250 men were employed by Morrison-Knudsen Co., Inc., in the construction of the powerhouse under the direction of R. H. Kirkman, Project Manager.

The Corps of Engineers was represented on the project by H. B. Elder, Resident Engineer. Col. Howard V. Canan is District Engineer of the Nashville District.

LIFT or PULL

Easier and Faster—
with the Amazing New
COFFING HOIST-JACK



A versatile 3-in-1 tool, this new Coffing Hoist-Jack provides greater efficiency and ease of operation on scores of lifting, pulling or stretching jobs. Simplified ratchet design and sturdy construction assure safety and long life. Weighs only 23 pounds, yet lifts a 2000 pound load. Operates with stand as a jack, or without stand as a hoist or binder; quickly set up, easily portable. Tested to 100% over rated capacity. Write for Bulletin D-1.

"SAFETY-PULL" HOISTS
Ratchet Lever type; Capacities from ¾ to 15 tons

OTHER COFFING PRODUCTS—Safety-Pull Ratchet Lever Hoists • "Mighty-Midget" Puller • Electric Hoists • Spur-Geared Hoists • Load Binders • Trolleys.

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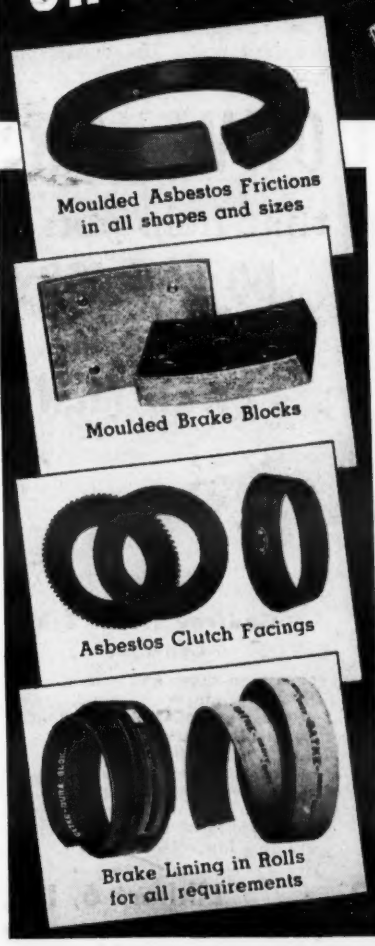
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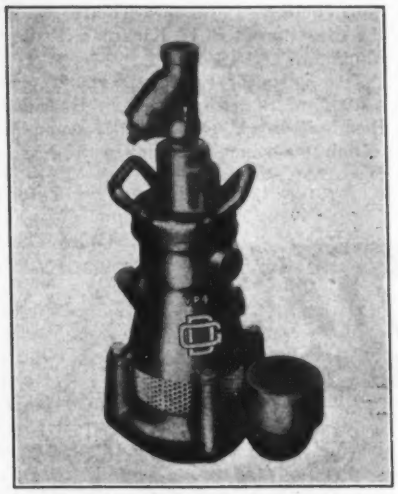


Gardner-Denver's new sump pump, the VP-4, embodies the principle of top suction to overcome one of the most common causes of pump failure—the breaking of the pump-shaft seal because of water pressure.

Sump Pump Features Use of Top Suction

A new sump pump designed to overcome one of the most common causes of pump failure—breaking of the pump-shaft seal because of water pressure—has been announced by the Gardner-Denver Co., 102 Williamson St., Quincy, Ill. This pump embodies the principle of top suction. It will be known as the Model No. VP-4 sump pump.

The manufacturer says that because of this feature the only pressure to which the oil seal is subjected when the pump is not in operation is static pressure from depth of immersion; and that when the pump operates, water cannot reach the oil seal on the air motor.

The VP-4 pump is operated by a vane-type air motor. The impeller is of the closed type, and is made of hard abrasion-resistant alloy. A built-in oiler lubricates all moving parts of the pump. The oil chamber has a capacity of one quart, or enough for one day's normal operation, Gardner-Denver explains. Grease fittings have been eliminated. The VP-4 is light in weight, and handles have been welded to the housing to make lifting and carrying easy.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 25.

Blast-Cleaning Unit Gives Abrasive Spray

A line of equipment for use in blast cleaning is made by the Sanstorm Mfg. Co., Santa Clara & H Sts., Fresno, Calif. Available in several models and styles, this equipment is designed to handle many types of abrasives, including sand, steel grit, shot, etc.

Chief feature claimed for the Sanstorm line is that the blast of compressed air is introduced into the machine through a nozzle orifice in the bottom of the abrasive tank. The abrasive is picked up by this air blast, and is carried out the top of the tank through an outlet pipe which extends down the center of the tank to the nozzle orifice. This system is said to keep the Sanstorm machine from becoming plugged or clogged, because the abrasive does not fall into the air blast, but is picked up by it and carried to the blasting nozzle. The amount of material discharged is regulated by raising or lowering the outlet pipe. Once this is set, the same amount of material is delivered no matter how often the machine is turned on or off, the company explains.

Another feature of this equipment is the provision made for dusting off finished work. This can be done by setting the end of the outlet pipe completely over the nozzle orifice, to shut off the abrasive supply and give a blast of clean air. The blasting hose is fastened to an elbow mounted on a special swivel to permit the hose to be swiveled in the direction of the work without moving the machine.

The equipment is made in five models with capacities varying from 100 to 650 pounds of sand. There are seven nozzles available with capacities from 13 to 211 cubic feet of air per minute.

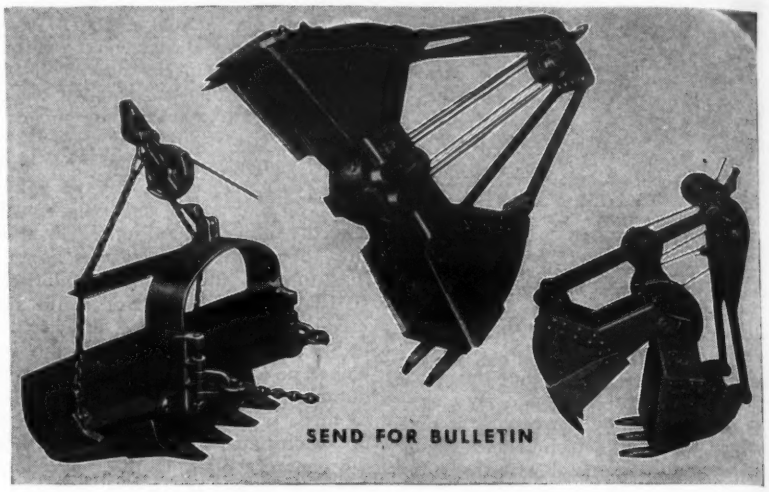
Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 5.

Concrete Pipe, Cribbing

Literature on its line of concrete pipe and concrete cribbing has been prepared by the Universal Concrete Pipe Co., 297 So. High St., Columbus 15, Ohio. The bulletin dealing with concrete pipe lists a few of the uses for this equipment, and describes the manufacturing methods developed by Universal for its production. The folder then shows the types of Universal pipe and their various applications: reinforced site-cast pipe; reinforced and non-reinforced pipe for use in sewers, culverts, underpasses, side drainage; etc.

The catalog on concrete cribbing covers the uses for this material and its major benefits. It then points out, with illustrated descriptions, several jobs in which Universal cribbing was used. Contained also, is information on the details of standard units, closed-face cribbing, and closed-face stretchers. General specifications and information on how to erect the concrete cribbing complete the booklet.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 72.



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Count on longer life and more efficient service..due to Wellman original **welded rolled steel construction.** You get the maximum digging power, and exceptional strength—without excessive weight! Specify Wellman, and you'll specify the best bucket for your purpose.

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with
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Godfrey Trough Belt Conveyor

...a man-saver and money-maker for all producers of sand, gravel, crushed stone, cinders and other abrasive materials.

Like all *Godfrey* Conveyors, it combines power, rigidity and strength to a degree that insures many years of continuous service life at a low operating cost.

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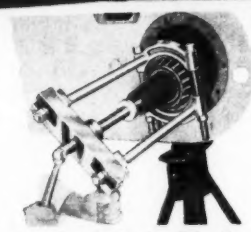
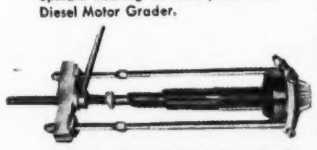
OTC PULLERS
OFTEN SAVE THEIR COST
ON ONE JOB!

• On many jobs of pulling and installing bearings, pinions, gears, sleeves, shafts, wheels and other close-fitting parts, OTC Pullers make BIG savings in time, labor and costly parts damage. It's the SAFE Way to speed up overhauling and repairs—on the job or in the shop. Approved by Bearing Manufacturers.

When you think of pullers, think of OTC—the only COMPLETE Puller Line. Ask your OTC Distributor or write for Service Bulletins on your equipment.



Removing the Tandem Drive Front Spindle Bearing on Caterpillar D-12 Diesel Motor Grader.



Removing Rear Bearing from Zerol Pinion Shaft on D7 and D6 Caterpillars.

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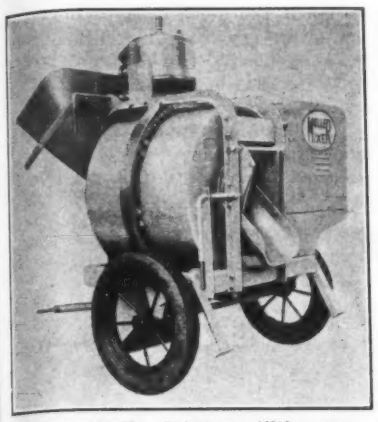
Factory Approved
For ALLIS-CHALMERS INDUSTRIAL TRACTORS • CATERPILLAR • LA PLANTE-CHOATE • CLETRAC INTERNATIONAL TRUCK • LA TOURNEAU
SPECIAL SETS OR PULLERS FOR EACH MAKE



The new Muller 3½-S non-tilting concrete mixer features balance for easy handling and fast discharge. It is equipped with an automatic water tank.

Non-Tilting Mixer

A 3½-S non-tilting concrete mixer has been added to its line of concrete equipment by the Muller Machinery Co., Inc., Metuchen, N. J. It is balanced for easy handling and to feature fast discharge, the company points out. The machine is equipped with an automatic water tank which can be set for predetermined quantities of water for each batch.

The drum and drumheads are made of heavy steel plate and revolve on wide solid-rubber rollers. Guide rollers are provided to hold true running location and prevent weaving of the drum. The drum is gear-driven, and a heavy roller chain transmits the power from the engine to the countershaft. An angle-iron frame for both hopper and discharge mechanism is provided for overall rigidity. The complete unit weighs approximately 1,000 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 7.

Barrel-Lifting Grips

Lightweight tongs for moving, loading, and stacking drums are now being manufactured by the Downs Crane & Hoist Co., 540 W. Vernon Ave., Los Angeles 37, Calif. The Chime Tongs are designed for heavy-duty service and to handle drums, with or without heads, from 18 to 24 inches in diameter.

According to the manufacturer, the lifting arms are self-equalizing, and both jaws have the same positive grip. Holding power is said to be unaffected by oily or greasy surfaces. Open drums can be handled without danger of spilling their contents, the company says, and the jaws will not kink or damage the drum in any way.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 44.

Gas-Welding Torches

Two new gas-welding torches and a new cutting-head attachment were recently introduced by the Wall Chemicals Division of The Liquid Carbonic Corp., 3100 So. Kedzie Ave., Chicago 23, Ill. The WA-54 welding torch is of the automatic type and is equipped with a lever-operated built-in gas saver. According to the manufacturer, when the torch is laid down during use, it goes out except for a small acetylene pilot flame. By depressing the lever when work is resumed, the operator has a welding flame ready for use without adjustment. It is also available in another model, the WA-54-B, which features a lever hold-down lock for continuous welding.

The AV-10 welding torch is designed for light welding, brazing, and soldering jobs. The cutting attachment for this torch can be furnished with tips in sizes 0, 1, and 2. It is said that the No. 2 tip will cut steel up to one inch thick. The cutting head is 90 degrees and is made of forged brass. The Gasweld AV-10 equipped with the WC-10 cutting attachment weighs 1 pound 2 ounces and is 12 inches long.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 14.

Diesel-Engine Operation

A 58-page booklet on the theory and operation of diesel engines has been made available by the Lanova Corp., 38-15 Thirtieth St., Long Island City 1, N. Y. It is called "The Lanova Combustion System for Diesels". It stresses the details of this particular system of controlled-rotary-turbulence combustion. and explains in detail what it is and how it functions. It also emphasizes the importance of proper combustion in diesel operation.

The booklet is designed to serve as a handy manual on diesel-engine performance for engineers and non-engineers alike. It contains elementary information on how a diesel operates and how it differs from gasoline or steam engines, and it compares the fuels used in these engines. Drawings and large-size type help to make the booklet highly readable.

The appendix contains several tables of engineering data. There are tables on fractions and decimals of inches and millimeter equivalents; useful formulae for 4-stroke-cycle engines; conversion factors; areas and circumferences of circles; calorific values of fuels; and diesel-engine thermal efficiency as determined from the specific fuel rate.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 61.

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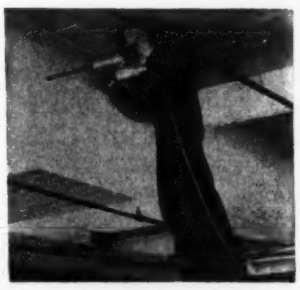

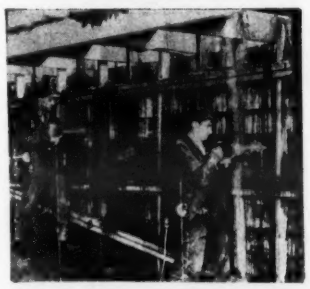

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SHOVEL FRONT

Chain Crowd Shovel Attachment complete with ¾ yard bucket for Lima Paymaster. This is a new attachment and has only been operated about twenty hours.

PRICE $2,500 F. O. B. PORT EVERGLADES, FLA.

PORTABLE GENERATOR ON WHEELS

Ideal Electric & Manufacturing Co. Type SA—KW 125—KVA 156—PF 80—RPM 1200—Cycles 60—Volts 240—480—Phases 3. This generator is equipped with Murphy Diesel Engine—Model ME Supercharged, 200 H.P. at 1200 RPM.

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BARBER-GREENE BUCKET LOADER

Machine Serial No. 552-5-16. Engine Serial No. 282793.

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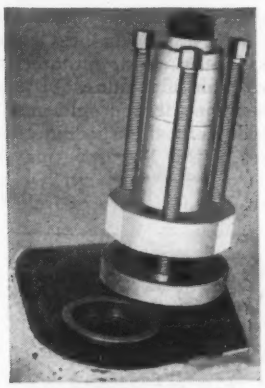

The Owatonna rear-axle-tube puller No. AC-900 is designed for use on Diamond T, White, International, Autocar, and other trucks using Eaton axles.

Rear-Axle-Tube Tool

A tool set for pulling rear-axle tubes on Eaton-built rear ends is announced by the Owatonna Tool Co., 348 Cedar St., Owatonna, Minn. Known as truck-axle tube puller No. AC-900, it is said to make possible rapid and efficient removal of these rear-axle tubes. The manufacturer recommends it for use on Diamond T, White, International, Autocar, and other trucks having Eaton axles.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 27.

Tamping-Roller Line

Tamping rollers in several styles and models are made by the American Steel Works, 1211 W. 27th St., Kansas City 8, Mo. They are designed to exert ground pressures which can be varied from 123 to 311 psi (loaded with water or wet sand) for the M Series; and from 190 to 575 psi for the A Series. Special models with other weights and specifications are manufactured to meet specific conditions.

The drums are built from extra-heavy steel plate, and feature all-welded construction and intermediate reinforcing heads. The tamper feet are made of special alloy steel, heat-treated and hardened. American rollers are built to be used as single, double, or triple units, through the use of a special conversion hook-up.

Two sizes of feet are available and the number per drum can be varied to meet specifications. The frames are mounted to permit each drum to float upwards or downwards independently of the others. The axle shafts are of one-piece cold-drawn steel, running the full length of each drum. They are said to remain stationary in the frame while the rollers revolve round them. A set of cleaning combs designed for quick attaching or detaching is furnished with each roller.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 12.

Carbon-Arc Torch Is Used With AC Welder

A lightweight carbon-arc torch is made by The Lincoln Electric Co., P. O. Box 5758, Cleveland 1, Ohio, for use with ac welding machines. It is designed to extend the use of this welding equipment to jobs where it is desirable to apply heat without melting the metal being worked on. Some uses recommended by the manufacturer include soldering and brazing, hard surfacing of thin materials, pre-heating small work areas prior to welding, heating and straightening bent work, general heating operations, etc.

A special gear arrangement has been incorporated into the unit to keep a constant angle between the carbon electrodes at all times. In operation, the copper-coated carbon electrodes are brought together to produce the desired arc, and a thumb tab then locks the gears in position.

The jaws of the torch are designed to hold either a 5/16 or ⅜-inch carbon without adapters or special jaws. There are two cable leads—one has a tip that is clamped to the regular electrode holder, and the other has a spring clip which attaches to the ground lead. The handle is constructed of a thermal plastic.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 96.

Small-Fittings Case

A case which holds small fittings, such as nuts, screws, bolts, washers, etc., is available from the Production Screw & Nut Co., Inc., 3110 So. Michigan Ave., Chicago 16, Ill. It is made of plywood and stands 15 inches high and 10 inches wide. There are spaces for ten drawers, and each drawer is subdivided into six or more compartments.

The kit has a carrying handle so that it can be moved from bench to bench. The drawers are 9½ x 4¾ x 1⅛ inches in size. The case provides a way to keep separated all sizes, shapes, and assortments of fittings; it also helps keep up inventories, because the status of the stock is apparent at all times. In use, the drawer containing the item desired is slid from the case and the lid is bent back to expose the inside of the drawer.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 35.

Do it All... WITH A MallSaw
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Model 60 Capacity: 2 inches

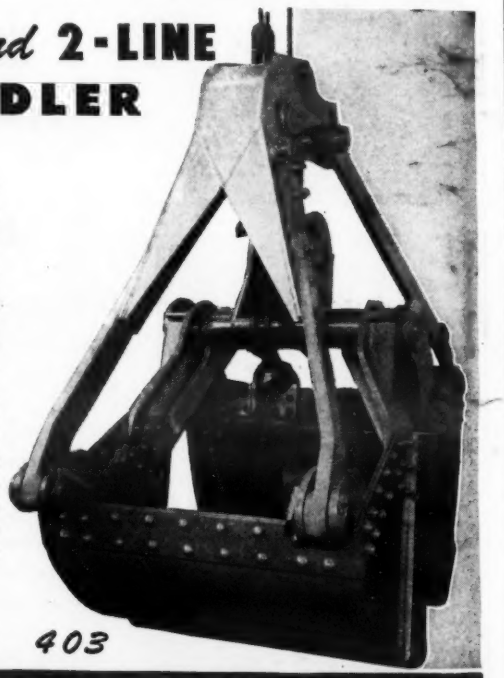
NEW MallSaw Table Stand
Latest accessory for Model 60 MallSaw. Height: 39"; Table area: 16" x 18"; Capacity: 1-15/16".

For practically every type of cut . . . in almost any material . . . as a hand saw or a table saw . . . use the Model 60 MallSaw. Interchangeable saw blades and abrasive discs . . . and a handy, lightweight table stand—complete with rip fence and mitre guide assembly—equip it for countless uses on the building area. Other models with 2¼", 2⅞" and 4½" capacities are also available for 110-volt AC-DC or 220-volt AC-DC.

Ask your Supplier or write Contractors' Equipment Division for literature and prices.

MALL TOOL COMPANY, 7743 South Chicago Ave., Chicago 19, Ill.

ERIE Standard 2-LINE REHANDLER



THIS compact Lever Arm Rehandler Bucket of normal proportions has ample closing power to fill to capacity in compact materials, and is so designed that the reeving can be adjusted to obtain maximum speed with capacity grabs in loose materials. We have reduced the "height open dimension" thus requiring minimum headroom, enabling you to pile higher and to discharge into higher hoppers. Lighter weight alloy construction provides more pay load (scoop contents) less bucket dead weight. To see this bucket in all detail write for bulletin 403.

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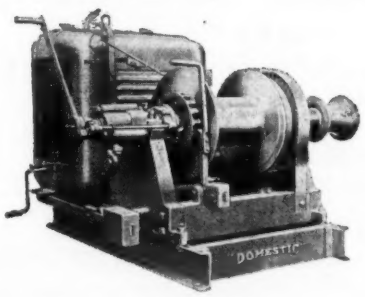

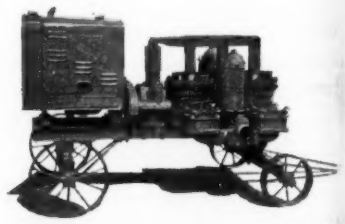

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Single and Double Drum Units
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Also Hand Diaphram Pumps

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DOMESTIC ENGINE and PUMP CO.
A Division of Empire Industries, Inc.
SHIPPENSBURG, PENNA.

Over 1,500 attended the 29th Annual Meeting of the Associated Equipment Distributors at the Edgewater Beach Hotel in Chicago, February 15-19, to discuss problems which affect the construction-equipment industry.

AED Discusses Credit And Taxes at Meeting

Speakers at 29th Annual Meeting Tell Group How to Meet Tighter Credit Conditions and How to Be Tax-Wise; Officers Elected

✦ BUSINESS problems which face the construction-equipment distributor received a thorough going-over at the 29th Annual Meeting of the Associated Equipment Distributors, which was held at the Edgewater Beach Hotel, Chicago, on February 15-19. Over 1,500 members attended the sessions.

Credit Conditions

Kenton R. Cravens, Vice President of the Mercantile-Commerce Bank & Trust Co. of St. Louis, and a member of the Credit Policy Committee of the American Bankers Association, spoke on changing credit conditions. Credit will become tighter and cost more, he said, unless the change now taking place in the commodity and security markets heralds the start of a much sharper, more prolonged decline or depression than can now be foreseen.

He declared that a tight credit situation will have a particular effect on the distributors of construction equipment and heavy machinery because of financial factors peculiar to the industry: the fact that heavy-machinery sales generally require longer-term credit—financing over periods of one year or more—and high original outlays of cash; that financing of this type of equipment is handled by both banks and finance companies, both faced with ceilings on the credit available to them; and that contractors increasingly prefer rental to purchase of equipment, and so cause the distributor to carry higher inventories. He warned that the industry is due for some financing problems, as a tight money situation works against long-term credit, and more and more pressure will be exerted on larger down payments and shorter maturities.

Mr. Cravens made several suggestions to help distributors meet the changing credit conditions: (1) Form a strong financial connection at once and use every means to build and fortify it. (2) Budget credit needs tightly and arrange for them as far in advance as possible. Budget to the absolute minimum and limit volume of business to keep within the budget. (3) Put their financial houses in good order—contract and consolidate rather than expand. (4) Prepare to pay more for the loans needed to carry on business, prepare for substantial tightening of terms, and plan to charge more for credit to finance sales.

Personnel Definitions

William A. Danner, outgoing President of the AED, spoke on some changes in definitions proposed by the Labor Department. "The members of our association are seriously concerned", he declared, "over the contemplated redefinition of the terms 'executive', 'administrative', 'professional', and 'outside salesman'. One of the changes proposed would not qualify a man as an executive, administrative, or professional employee unless he is paid a guaranteed salary of $500 a month or more." Mr. Danner pointed out that he was speaking only in behalf of the distributor members in regard to the measure.

"These drastic changes", he went on, "would have a crippling effect on small employers who cannot pay salaries as high as some of the larger companies. In such cases many of our members will be entirely deprived of existing exemptions", he pointed out. And he continued, "Small businesses require

(Concluded on next page)

AED Discusses Credit And Taxes at Meeting

(Continued from preceding page)

more flexibility than larger business in the amount of non-exempt work, because they do not have the large staffs or the need for as many specialists."

Decentralization

The importance of local distributors as small businessmen in America was stressed in a speech by Ed Wimmer, Vice President of the National Federation of Small Business, Inc. Citing the present trends towards big labor, big business, and big government, Wimmer told the AED members that immediate action is needed in order to save free enterprise.

"The present rate of destruction of competitive, independent enterprise in this nation is laying the foundation for totalitarianism. If something isn't done within the next two years to reverse this trend, we will lose the opportunity", Wimmer warned. "The little fellow", he continued, "is the best bet of the future. Increase his number and give him a free market, and you won't need to worry about the bigs, and the bigs won't need to worry about their future."

Tax Planning

E. Charles Eichenbaum of Little Rock, Ark., spoke on tax planning for buyer and seller. Mr. Eichenbaum is Chairman of the Federal Excise Tax Section of the American Bar Association, and Vice President of Lyons Machinery Co.

He stressed the importance of obtaining knowledge and information on tax planning. And he pointed out that an essential equipment program should not be defeated by lack of information on how the purchaser may coordinate such purchases with his general fiscal or economic program. He showed how the incidence of taxes may be modified or borne to the best advantage of the individual companies which are involved in a transaction.

"The informed taxpayer", he said, "may frequently find that the flexibility permitted in setting depreciation rates enables him to find a capital outlay for equipment less onerous than he had anticipated". Mr. Eichenbaum urged distributors to help sell to the nation's lawmakers "a firm and fundamentally sound tax and fiscal program if we are to preserve our economic heritage of leadership".

These seven men were elected officers of the Associated Equipment Distributors at the group's 29th Annual Meeting. From left to right, the three men standing are Treasurer Eldon M. Farnum of Allied Construction Equipment Co., St. Louis, Mo.; Vice President R. L. Arnold of Arnold Machinery Co., Inc., Salt Lake City, Utah; and Vice President V. J. Sheridan of Sheridan Equipment Co., Ltd., Leaside, Ontario, Canada. The four men seated are Executive Secretary F. G. Knight, AED Executive Office, Chicago; Executive Vice President W. W. Bucher of R. E. Brooks Co., New York City; President A. F. Garlinghouse of Garlinghouse Brothers, Los Angeles; and Vice President C. F. Halladay of Halladay-Dettman Co., Sioux Falls, S. Dak.

Other Speakers

Col. Robert A. Fleming of the U. S. Army Corps of Engineers, Washington, D. C., spoke before the group and urged increased participation in the Army's Affiliation Program for specialized service-type units.

J. T. Callaway, President of the American Road Builders' Association, lauded the construction-equipment industry and pointed out that the tremendous construction jobs of today could not be accomplished for ten times present costs without the cost-cutting man-hour-saving machinery designed by the industry. He also gave AED members a preview of the 1948 Road Show.

Another address was delivered by E. E. Esgate, Logging Engineer of the American Pulpwood Association. He spoke on how the distributors can help the pulpwood industry and open up new markets for their own products.

Dwight W. Winkelman, President of The Associated General Contractors of America, Inc., predicted that the construction industry can carry out a record dollar volume of construction activity under constantly improving conditions during 1948—unless the material requirements of the European Recovery Program cause crippling shortages in this country. He reminded his audience of the proposed national joint board of employer and labor representatives to settle jurisdictional disputes. And he said that construction work can be undertaken with greater assurance that strikes will not cause delays.

Winkelman forecast more than $15,000,000,000 in construction throughout the country, and a total volume approaching $23,000,000,000 when expenditures for maintenance and repair are added. Speaking of construction costs he said, "Although few of us would like to commit ourselves definitely, there is much hope that the time is fast approaching when construction costs will become stabilized. The break in the upward spiral of commodity prices and others gives hope that in the near future this can lead to a stabilization of construction costs."

Officers Elected

A. F. Garlinghouse, Garlinghouse Bros., Los Angeles, was elected President for the coming year. W. W. Bucher, R. E. Brooks Co., New York City, was elected Executive Vice President. V. J. Sheridan, Sheridan Equipment Co., Ontario, Canada, and C. F. Halladay, Halladay-Dettman Co., Sioux Falls, S. Dak., were re-elected Vice Presidents, and Ray L. Arnold, Arnold Machinery Co., Inc., Salt Lake City, Utah, was elected a Vice President. Eldon M. Farnum of Allied Construction Equipment Co., St. Louis, was reelected Treasurer. Frank G. Knight continues as Executive Secretary.

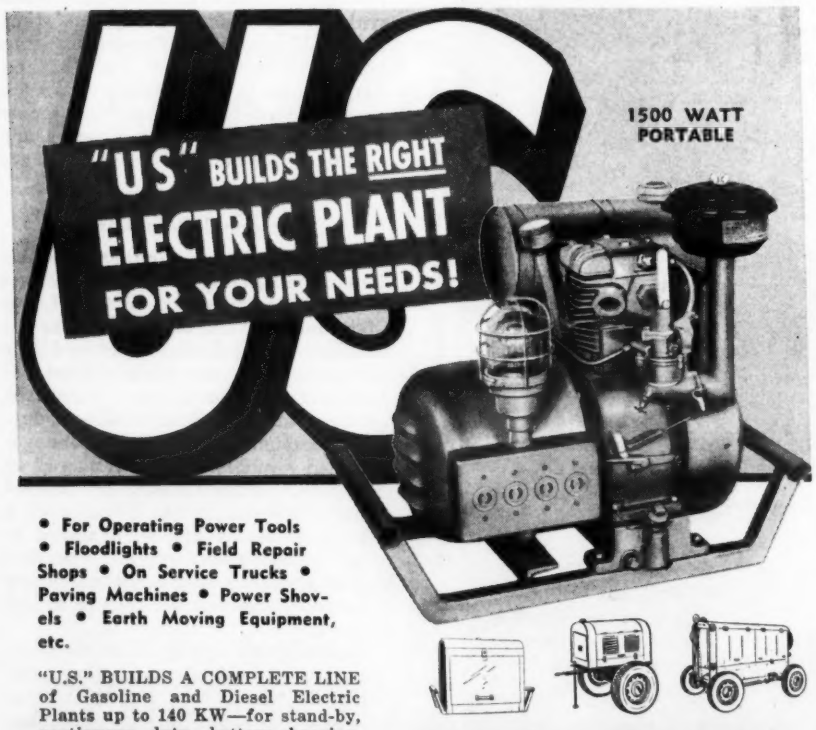
Regional directors are: Region 1, E. J. Crosby, Hedge & Mattheis Co., Boston; Region 2, W. W. Bucher, and Harry J. Hush, Griffin Equipment Corp., New York City; Region 3, S. John Oechsle, Metalweld, Inc., Philadelphia; Region 4, L. H. Wade, of Henry H. Meyer Co., Inc., Baltimore, Md.; Region 5, E. B. Wilkinson, of Wilson, Weesner, Wilkinson Co., Knoxville, Tenn.; Region 6, J. Walker Wilson, J. Walker Wilson Machinery Co., Youngstown, Ohio; Region 7, G. E. Hillsman, Hillsman Equipment Co., Chicago; Region 7, C. F. Halladay of Sioux Falls, S. Dak.; Region 9, W. A. Clayton, Fuchs Clayton Machinery Co., Omaha, Nebr.; Region 10, Jewel Benson, Benson Tractor Co., Houston, Texas; Region 11, Jack How, Edward R. Bacon Co., San Francisco, and Al Garlinghouse; Region 12, L. W. Gardner, Howard Cooper Corp., Portland, Oreg.; Region 13, Maxwell J. Lyons of Lyons Machinery Co., Little Rock, Ark.; Region 14, Ray L. Arnold, Arnold Machinery Co., Inc., Salt Lake City, Utah; and Region 15, V. J. Sheridan.

Grips for Lifting

Grips for use in the handling of open-top containers, sheet stock, plates, and other materials are manufactured by the Industrial Products Co., 2914 No. 4th St., Philadelphia 33, Pa. The jaws of these grips operate on an eccentric principle, and are said to grip tighter for heavier loads.

Granny-Grips come in single and double-strand construction. Throat capacity is from 0 to 1 inch for both kinds. The single-strand type is said to test to 7,850 pounds, is fitted with 14½ inches of chain, and weighs 13 pounds. Overall length is 29½ inches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 29.



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Use these single acting jacks for safe, sure work in lifting, lowering, pushing or pulling. Double lever sockets speed work in cramped quarters and in angular lifting. All models will lift full capacity on the toe or on the cap—a feature that only Simplex can give you.

Available in 10 models with capacities ranging from 5 to 35 tons, and lift from 7 to 18 inches. All have two-way standard lever socket except three largest models; these are available with any of three types of sockets. Delivered with lever included.

For full information, write for Bulletin: Industrial 48.

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Available in eight models to handle from 3 to 100 tons — tested to 100% overload. Write for Bulletin HJ-47.

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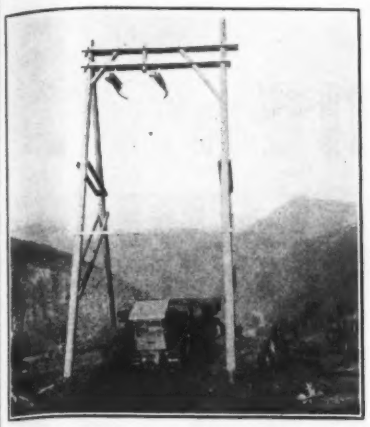

An Allis-Chalmers HD-5 diesel tractor clears the base of an unloading tower on a new ski lift built at the top of Stevens Pass, 100 miles northwest of Seattle, Washington. The 4,770-foot-long slide is 5,115 feet above sea level. The tractor also built a 1½-mile road leading to the lift.

Line of Fifth Wheels For Truck Trailers

A line of fifth wheels is offered to truck-trailer users by the Austin Trailer Equipment Co., 1148 W. Western Ave., Muskegon, Mich. These fifth wheels are made in four models to cover a wide range of uses.

Model No. 1275 is said to be a full-floating Rubb-Air cushioned unit that absorbs road shocks and makes the load ride easier. It incorporates safety features such as an automatic safety lever lock, and a duplicate king-pin locking device. Model No. 1300 is a full-oscillating or universal type cushioned on rubber buffers designed to eliminate shocks, stabilize trailer loads, and absorb longitudinal strains. The manufacturer recommends it especially for use in tank-trailer operations. Model No. 1500 features Rubb-Air cushions with gravity cushion suspension. This is said to reduce clutch loading and to eliminate braking shock.

Model No. 1600 features an exclusive Austin-patented device which enables power to be transmitted from the truck power take-off to hoist, winch, dump, or other take-off equipment mounted on a semi-trailer. The power line is connected after the trailer is coupled, by shifting a manual control lever. Power is delivered regardless of the trailer's position with respect to the truck, the manufacturer states. Power is controlled by the operator through a take-off lever in the cab.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 33.

Gasoline Engine

Several improved features have been added to the Model 1200 DH vertical-shaft gasoline engine, according to its manufacturer, the McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif. This engine weighs 24 pounds and is rated at 2½ hp at 2,500 rpm.

An oil-bath air cleaner and a visible sediment-type fuel filter are designed to protect the engine against dust, chaff, and other abrasives. All bearings, including thrust bearings, are of the anti-friction type. The design of this engine permits direct coupling to engine-driven products requiring vertical drives.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 95.

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CONVEYOR, ELEVATOR and TRANSMISSION BELTING all widths and plies
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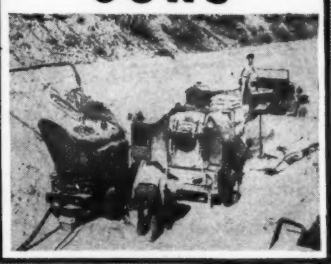

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CENTRIFUGAL
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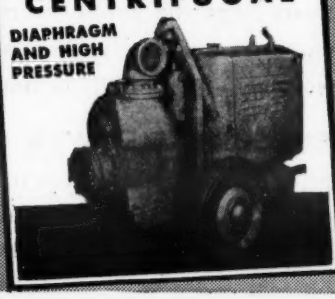

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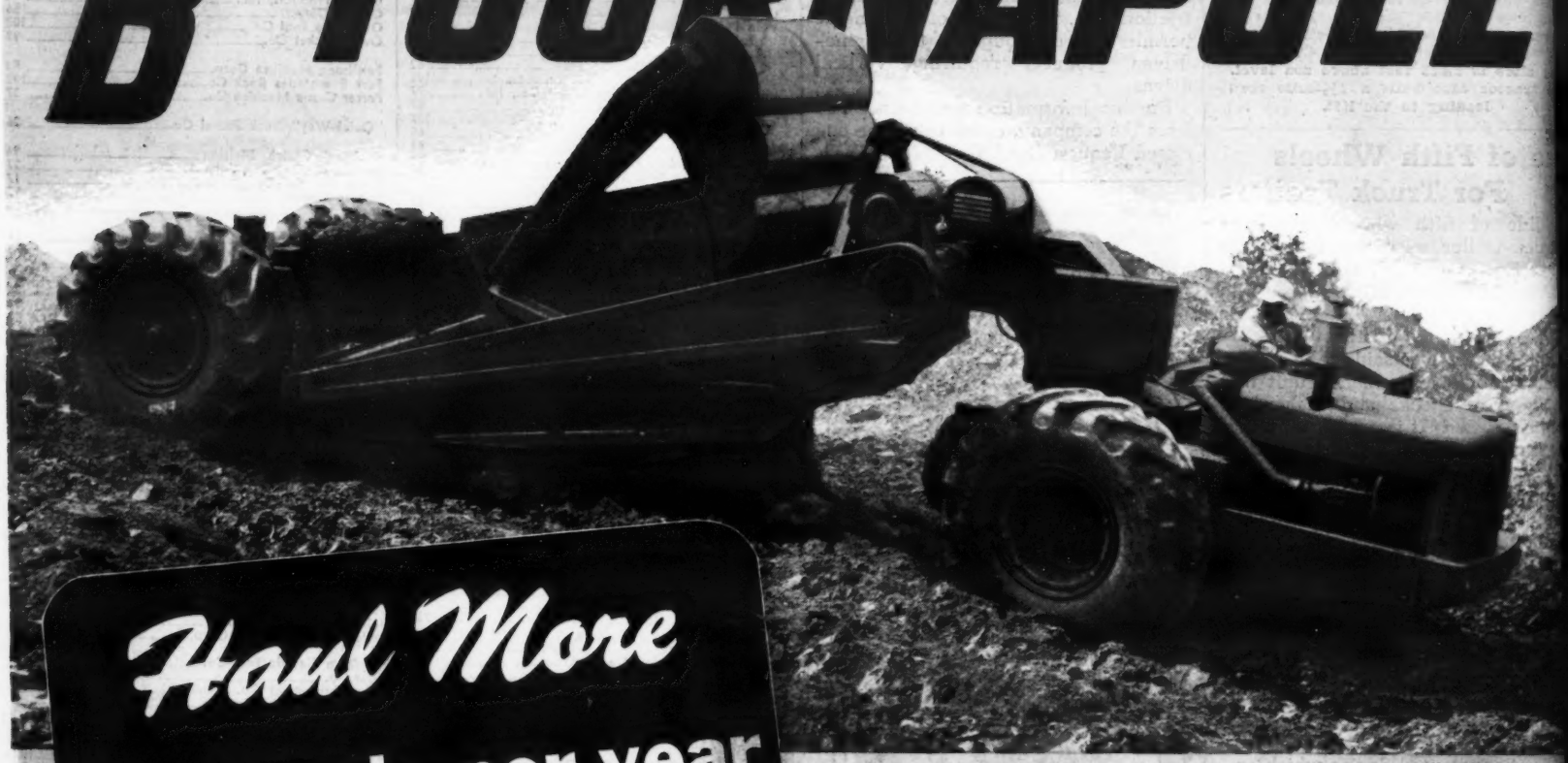

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